JULY 1984

(REVISED DECEMBER 1984)

BEACH EROSION CONTROL PROJECT REVIEW STUDY AND ENVIRONMENTAL IMPACT STATEMENT FOR PINELLAS COUNTY, FLORIDA

US Army Corps of Engineers
Jacksonville District

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-PE

July 27, 1987

SUBJECT: Pinellas County, Florida

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on shoreline erosion control for Pinellas County, Florida. It is accompanied by the reports of the Board of Engineers for Rivers and Harbors and the Division and District Engineers. These reports are in response to United States Senate Public Works Committee Resolution adopted 4 March 1976 and the United States House of Representatives Public Works and Transportation Committee Resolution adopted 23 September 1976. The Committees requested a review of beach erosion control reports on Pinellas County, Florida, to determine the advisability of extending the period of Federal participation in nourishment costs of the existing project. The Pinellas County project was conditionally authorized for construction in Section 501(b) of the Water Resources Development Act of 1986, subject to a favorable report of the Chief of Engineers and approval by the Secretary of the Army.

2. The District and Division Engineers recommend authorization of improvements for beach erosion control on seven barrier islands fronting the Gulf of Mexico shoreline of Pinellas County. The specific barrier islands involved are Honeymoon Island, Caladesi Island, Clearwater Beach Island, Sand Key, Treasure Island, Long Key and Mullet Key. The plan provides for restoration of 9.1 miles of beach on three of the seven affected islands and for periodic nourishment of beaches on all the islands, having a combined nourishment length of 35.1 miles. Beach restoration and nourishment material would be from offshore borrow areas.

3. The Board of Engineers for River and Harbors recommends authorization of improvements for beach erosion control along the shores of Pinellas County, Florida, generally in accordance with the recommendations of the reporting officers, and subject to cost sharing and financing arrangements satisfactory to the President and Congress. The total first cost of the plan, based on October 1986 price levels, is $27,990,000, of which $14,165,000 would be Federal based on traditional cost sharing policies. The non-Federal first costs would be $13,825,000 plus all costs associated with placement of fill on private properties landward of the Erosion Control Line to be

established by the State of Florida at the time of construction. Average annual charges, based upon a 50-year period of analysis and an interest rate of 8-7/8 percent, are $4,614,000 including $2,095,000 for periodic beach nourishment. The estimated average annual benefits amount to $14,327,000 and result in a benefit-cost ratio of 3.1. The plan maximizes net National Economic Development benefits.

4. One of the project barrier island segments, Mullet Key, requires specifically identified recreational benefits for economic justification. In addition, two other project segments, Honeymoon Island and Caladesi Island, are justified on the basis of the prevention of loss of land area which is used exclusively for recreational purposes. Federal water projects designed primarily to provide recreational opportunities are inconsistent with current policy to rely on the non-Federal sector to provide public services whenever possible. Accordingly, I do not recommend Federal participation in the provision of beach erosion control measures along Mullet Key, Honeymoon Island and Caladesi Island. On the other hand, benefits from improvements along Clearwater Beach Island, Sand Key, Treasure Island and Long Key accrue primarily from the prevention of damages to upland properties. Recreation benefits associated with these particular improvement measures are jointly produced with the aforementioned damage prevention benefits. That is, there are no separable or additional costs required to produce the respective recreational outputs along the four project segments enumerated above. Moreover, the recreation benefits derived along each of these four segments constitute less than fifty (50) percent of the total benefits computed for the respective project segments.

5. In accordance with the conditions outlined above, I recommend a modified project plan which would provide erosion control improvements along Clearwater Beach Island, Sand Key, Treasure Island and Long Key. These segments of the original project plan are recommended as formulated by the reporting officers except that Federal participation in periodic beach nourishment should be limited to the 50-year economic life of the project rather than the "project life" as stipulated by the reporting officers. Specifically, the recommended modified plan

involves restoration of 8.3 miles of beach and provision of periodic nourishment affecting 24.9 miles of shoreline. The reformulated project plan recommended hereby has an estimated total first cost of $27,134,000, based on October 1986 price levels, of which the Federal share would be $15,873,000 based on cost sharing policies set forth in Public Law 99-662, the Water Resources Development Act of 1986. The non-Federal share of project first costs would be $11,261,000 plus all costs associated with placement of fill on private properties landward of the Erosion Control Line to be established by the State of Florida at the time of construction. Average annual charges, based on a 50-year period of analysis and an interest rate of 8-7/8 percent, are $4,085,000 including $1,643,000 for beach nourishment. Total average annual benefits are estimated at $11,959,000, resulting in a benefit-cost ratio of 2.9. The recommended plan also maximizes net National Economic Development benefits.

6. The recommendations contained herein reflect information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Accordingly, I recognize that the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation funding.

E. R. HEIBERG III
Lieutenant General, USA
Chief of Engineers

DEPARTMENT OF THE ARMY
BOARD OF ENGINEERS FOR RIVERS AND HARBORS
KINGMAN BUILDING
FORT BELVOIR, VIRGINIA 22060

REPLY TO
ATTENTION OF:

BERH-PLN

23 APR 1985

SUBJECT: Pinellas County, Florida

Chief of Engineers
Department of the Army
Washington, DC 20314-1000

Summary of Board Action

The Board finds that restoration and periodic nourishment of the barrier island beaches of Pinellas County, Florida, are economically feasible and warranted in the interests of erosion control. Erosion threatens loss of public and private properties and public recreational use areas. The recommended plan will provide for rehabilitation of 48,000 feet of beach on three of the seven affected islands and for periodic nourishment of beaches on all the islands. Initial project construction costs are estimated at $27,650,000, and the benefit-cost ratio is 3.4. The Board recommends the plan in accordance with cost-sharing and financing arrangements satisfactory to the President and the Congress.

Summary of Report Under Review

1. Authority. This report is in response to United States Senate Public Works Committee Resolution adopted 4 March 1976 and House of Representatives Public Works and Transportation Committee Resolution adopted 23 September 1976. The Committees requested a review of beach erosion control reports on Pinellas County, Florida, to determine the advisability of extending the period of Federal participation in nourishment costs of the existing project. The resolutions are quoted in the District Engineer's Report.

2. Description of the study area. Pinellas County is on the Gulf of Mexico coast of Florida, about midway on the State peninsula. The coastline consists of numerous barrier islands, which range in width from about 200 to 2,000 feet, and have elevations varying from 5 to 10 feet above mean low water. The islands are separated by natural passes, several of which are improved or being considered for improvement for navigation. The islands within the study area are Honeymoon Island, Caladesi Island, Clearwater Beach Island, Sand Key, Treasure Island, Long

Key, and Mullet Key. Honeymoon and Caladesi Islands are largely owned and maintained by the State of Florida as park and recreational areas. Mullet Key is owned by Pinellas County and is developed as a regional park. The other islands are heavily developed for recreational and residential purposes. All the islands except Caladesi are connected to the mainland by bridges and causeways. Vegetation on the islands consists of grasses, herbs, and shrubs with stands of Australian Pine. Due to the extensive development, wildlife is limited to rodents, small reptiles, and a large variety of passerine, shore, and wading birds. The study area also supports a rich variety of fishes and invertebrates. Potential threatened and endangered species include the green, loggerhead, and leatherback sea turtles; brown Pelican; Manatee; and Bald Eagle.

3. Economic development. The 1980 population of Pinellas County was 728,409. In addition, nearly 4 million tourists visit the study area each year. Because of the area's popularity as a retirement center and its attraction for tourists, most employment and economic activities are in the service and trade industries. In 1977 there were 798 licensed hotels and motels and over 1,700 licensed food service establishments in Pinellas County. Tourist related industries employ almost 37,000 persons and have a combined annual payroll of over 200 million dollars. Most of the remaining employment is in government or manufacturing.

4. Existing improvements.

a. Federal.

(1) Existing beach erosion. The existing Federal beach erosion control project includes:

(a) Restoration of 5,000 feet of beach at Clearwater Beach Island;

(b) Restoration of 49,000 feet of beach at Sand Key;

(c) Restoration of 9,200 feet of beach on Treasure Island;

(d) Nourishment of 5,600 feet of beach on Long Key;

(e) Construction of 600 feet of revetment at Long Key; and

(f) Construction of a recreation beach 6,700 feet long, an anchor groin 420 feet long at the south end of the beach, and 1,150 feet of revetment around the southern tip of Mullet Key.

(2) Navigation. Navigation projects include Tampa Harbor, Pass-a-Grille Pass, St. Petersburg Harbor, Johns Pass, Clearwater Pass, Ozona Channel, Anclote River, and the Intracoastal Waterway from the Caloosahatchee River to the Anclote River.

b. Non-Federal. Local interests have constructed retaining walls, groins, and jetties with varying effectiveness. Local governments have also nourished beaches in several park areas and in eroded areas adjacent to navigation and natural passes between the islands.

5. Problems and needs. Shoreline erosion is occurring throughout the study area. Erosion has been accelerated by local developments that have eliminated the natural dunes and obstructed the littoral sand movements. Erosion is also caused by natural current and wave actions, particularly those occurring during severe storms. These erosive actions result in loss of land, damage to development, and loss of suitable beach for recreation. Reinforcement of the natural beaches through restoration and continued nourishment is needed.

6. Improvements desired. Local interests desire and support a program that will provide permanent remedial measures for beach erosion and related problems throughout Pinellas County.

7. Alternatives considered. A large array of structural and nonstructural measures was addressed during formulation of erosion and storm protection plans for Pinellas County. Nonstructural plans included condemnation, evacuation, and rezoning programs for the floodplain; a construction moratorium and setback regulation; and enactment of building codes and flood insurance programs. Structural plans included construction of beach and storm berms providing various levels of protection; dune stabilization; and construction of seawalls, revetment, and offshore breakwaters.

8. Plan of improvement. The District Engineer's recommended plan consists of restoration and future nourishment of 9.1 miles of protective beach berms and periodic nourishment of 19.1 miles of additional shoreline to maintain existing beaches. The restoration and nourishment material would be dredged from offshore ocean sand bars and areas adjacent to navigation passes. Specific provisions of the plan include the following:

a. Initial beach nourishment of 4,500 feet of Honeymoon Island with periodic nourishment thereafter.

b. Periodic nourishment of Caladesi Island.

c. Initial nourishment of 5,000 feet of Clearwater Beach Island with periodic nourishment thereafter.

d. Initial nourishment of 38,500 feet of Sand Key with periodic nourishment thereafter.

e. Continued nourishment of existing projects at Treasure Island, Long Key, and Mullet Key.

9. Economic evaluation. Based upon October 1983 price levels, the District Engineer estimates the first cost of his selected plan at $27,650,000, of which $13,661,000 would be non-Federal under traditional cost-sharing policies. The estimated annual cost is $4,166,000. Average annual benefits are estimated at $14,476,000, and the benefit-cost ratio is 3.5. The recommended plan maximizes net National Economic Development benefits.

10. Project impacts. Adverse impacts on benthic organisms and water quality would occur during dredging and deposition of beachfill material. However, recovery of both should occur rapidly upon cessation of dredging operations. The proposed project would be within the designated critical habitat of the "endangered" Florida Manatee and could affect nesting areas of "threatened" sea turtles. However, the recommended plan includes protective measures for both the manatee and turtles. These measures have been found acceptable to the U.S. National Marine Fisheries Service and the U.S. Fish and Wildlife Service. Positive impacts of the project include prevention of land loss, protection of commercial and residential structures, maintenance of recreational beach areas, and erosion protection of Fort DeSoto which is listed in the National Register of Historic Places.

11. Recommendations of the reporting officers. The District Engineer recommends beach erosion control measures for the seven principal barrier islands of Pinellas County, Florida. His recommendation includes new improvements for Honeymoon and Caladesi Islands and for modification of the existing Federal projects on Clearwater Beach Island, Sand Key, Treasure Island, Long Key, and Mullet Key.

a. The recommendation for Honeymoon and Caladesi Islands provides for restoration of beaches on Honeymoon Island and for future periodic nourishment of beaches on both islands throughout the useful life of the recommended plan. The District Engineer recommends the improvements in accordance with the plan defined in his report and subject to certain items of local cooperation.

b. The recommendations for Clearwater Beach Island, Sand Key, Treasure Island, Long Key, and Mullet Key provide for modification of the existing Federal projects for beach erosion control on those islands and include extension of the Federal participation in periodic nourishment from 10 years to the remainder of useful project life. The District Engineer recommends these improvements in accordance with the plan defined in his report and subject to local interests complying with elements of local cooperation specified in House Documents 519/89/2 and 516/89/2.

The District Engineer's recommendations are made subject to cost-sharing and financing arrangements which are satisfactory to the President and the Congress. The Division Engineer concurs.

Review by the Board of Engineers for Rivers and Harbors.

12. General. The Board's review encompassed the overall technical, economic, social, institutional, and policy aspects involved in the plan of improvement recommended by the reporting officers to reduce erosion damages and provide additional recreational beach in Pinellas County, Florida. The Board considered the report's conformance with the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. The Board also considered the views of interested parties, including Federal, State, and local agencies.

13. Response to the Division Engineer's public notice. The Division Engineer issued a public notice on 17 September 1984 stating the recommendation of the reporting officers and inviting public comment to the Board. Five letters were received in response to the public notice, all in support of the recommended plan.

14. Findings and conclusions. The Board of Engineers for Rivers and Harbors concurs in the findings and recommendations of the reporting officers. The recommended plan is economically justified, technically sound, and environmentally acceptable. The plan will stabilize the shoreline of the seven offshore islands of Pinellas County. The protective berm will provide erosion protection to upland residential, commercial, and public properties, eliminate costs of maintenance to existing shoreline retaining structures, reduce losses of public property, and provide additional public recreational beach areas.

15. The recommended plan includes benefits for reduced erosion damages to commercial and residential structures. The Board notes that, even with the shoreline erosion protection provided, flooding from storms that overtop the protective berm would result in some structural damages. These residual flood damages were not specifically evaluated in the District Engineer's report. However, reporting officers have furnished additional information which demonstrates that, in the case of Pinellas County, any overstatement of damage reduction would be small in relation to total damage reduction benefits. Also, the protective beach berm would provide flood damage reduction benefits for protection from less intense, more frequent storms which were not credited to the project. Accordingly, the Board does not believe revisions to the study analyses are warranted since consideration of flood damages would not significantly impact formulation of the recommended plan.

16. The reporting officers' analysis of recreation demand for Pinellas County is 41 percent higher than the Florida State Comprehensive Outdoor Recreation Plan's (SCORP) projected value. The increased annual visitation estimate was derived from a partial one-day beach count and recorded county park usage. The Board believes the estimate should be supported by multiple beach counts and a more thorough consideration of varying beach conditions, developments, and facilities that exist throughout the study area. However, the only element of the recommended plan in which economic feasibility is sensitive to the magnitude of recreation benefits is Mullet Key. Mullet Key is developed as a multiple use recreation area. Because of its extensive development, separation from other beach areas, and unique attractions, Mullet Key can appropriately be assumed to draw visitation from a broader regional demand than the other islands. On this basis, the reporting officers conducted a sensitivity analysis of Mullet Key economic feasibility. That analysis shows the recommended improvements are still well justified economically. Accordingly, the Board concludes that further refinement of the recreation benefit studies for the Pinellas County report is not warranted.

17. Total project costs, based on October 1984 price levels, are estimated at $27,650,000. Annual costs, including future nourishment, and based on 8-3/8-percent interest rate and a 50-year period of economic analysis, are estimated at $4,212,000. The average annual benefits are estimated at $14,302,000, and the benefit-cost ratio is 3.4.

18. Traditional cost-sharing policies provide for no Federal participation in protection of private lands, 50-percent participation in the cost of initial construction and periodic

nourishment for protection of publicly owned and used shores, and 70-percent Federal participation for protection of publicly owned and used park and recreation areas. On this basis, 50.6 percent of the first costs ($13,989,000) and 52.2 percent of the annual charges ($2,175,000) would be borne by the Federal Government. However, the Administration's policy on water project financing and cost-sharing is that all Federal water development agencies will continue to seek out new partnership arrangements with the states and other non-Federal interests in the financing and cost sharing of all proposed projects. Each such agency will negotiate reasonable financing arrangements for every project within its respective area of responsibility. In addition, prior commitments to individual states with regard to water development within their borders must be considered and shall be a factor in negotiations leading up to project construction; and consistency in cost sharing for individual project purposes, with attendant equity, will be sought. Project beneficiaries, not necessarily governmental entities, should ultimately bear a substantial part of the cost of all project development.

19. <u>Recommendation</u>. The Board recommends authorization for modification of the existing Federal beach erosion control projects for Clearwater Beach Island, Sand Key, Treasure Island, Long Key, and Mullet Key, Florida, and for new beach erosion control improvements on Honeymoon and Caladesi Islands, Florida, generally in accordance with the reporting officers' selected plan, with such modifications as in the discretion of the Chief of Engineers may be advisable. The recommended modification provides that Federal participation in periodic beach nourishment of the existing projects be extended to coincide with the useful life of the selected plan. These recommendations are subject to cost-sharing and financing arrangements satisfactory to the President and the Congress and with the provision that prior to implementation of improvements, non-Federal interest will, in addition to the general requirements of law for this type of project, agree to comply with the following requirements:

✓ a. Provide a cash contribution for beach erosion control, exclusive of lands, easements, rights-of-way, and relocations, with the percentage to be in accordance with existing law and based on shore ownership and use existing at the time of construction. The apportionment of costs is to be made after final construction costs have been determined;

✓ b. Contribute in cash, amounts computed in accordance with cost-sharing provisions contained in Public Law 826, Eighty-fourth Congress, as amended by Public Law 87-874, for beach nourishment costs for the useful life of the project, such contributions to be prior to each nourishment operation;

c. Provide all necessary lands, easements, rights-of-way, and relocations required for construction and subsequent nourishment and maintenance of the project;

d. Assure continued public ownership and use of the shore upon which the amount of Federal participation is based, and its administration for public use during the useful life of the project;

e. Hold and save the United States free from all claims for damages which may result from construction and subsequent maintenance, operation, and public use of the project, except damages due to the fault or negligence of the United States or its contractors;

f. Provide and maintain necessary access roads, parking areas, and other public use facilities open and available to all on equal terms.

20. The recommendations contained herein reflect information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation funding.

FOR THE BOARD:

N. G. Delbridge, Jr.

N. G. DELBRIDGE, JR.
Major General, USA
Chairman

SADPD-P (17 Aug 84) 1st Ind
SUBJECT: Feasibility Report for Beach Erosion Control - Pinellas County, Florida (13013)

DA, South Atlantic Division, Corps of Engineers, 510 Title Building, 30 Pryor Street, S. W., Atlanta, Georgia 30335-6801 13 September 1984

TO: Board of Engineers for Rivers and Harbors, Kingman Building, Fort Belvoir, Virginia 22060-5576

I concur in the recommendations of the District Engineer.

Forrest T. Gay III
FORREST T. GAY, III
Brigadier General, USA
Commanding

SYLLABUS

The purpose of this report was to reexamine the problem of beach erosion along the Pinellas County gulf shore, develop the most suitable plan for restoration and protection of problem areas and review the 1966 authorized project to determine the advisability of extending Federal participation in periodic nourishment cost.

The District Engineer finds that erosion and lowering of the profile have occurred along most of the Pinellas County gulf shore and erosion damage has occurred along the shore of unconstructed segments of the 1966 authorized project. Stabilization of the eroded shore by replacing beach material lost to storm damage and other erosion resulting from natural forces with suitable beach sand from other sources is needed to prevent further damage and to provide and maintain protective and recreational beaches. The selected plans provide for:

Initial nourishment of 4,500 feet of Honeymoon Island with periodic nourishment of the island through project life;

Periodic nourishment of Caladesi Island in conjunction with nourishment of Honeymoon Island through project life;

Initial nourishment of 5,000 feet of shore at Clearwater Beach Island with periodic nourishment of the island through project life;

Initial nourishment of 38,500 feet of shore at Sand Key with periodic nourishment of the island through project life;

Continued nourishment of Treasure Island through project life;

Continued nourishment of Long Key through project life; and

Continued nourishment of Mullet Key through project life.

Material for the initial fill and future nourishment would be obtained from a borrow area in the gulf and from shoals associated with the numerous inlets in the county. The gulf borrow area is located 6,700 feet offshore of Mullet Key. The estimated first cost of the plan of improvement is \$27,650,000. The estimated annual cost for interest, amortization, and future nourishment is \$4,166,000, with annual benefits of \$14,476,000. The B/C ratio is 3.5 to 1.

The District Engineer recommends, subject to certain conditions of local cooperation as outlined in this report, modification of the existing Federal project for beach erosion control in Pinellas County at a total estimated first cost to the United States based on existing shorefront ownership estimated to be \$13,989,000 and an annual cost of \$986,600 for continued periodic nourishment. These amounts would vary according to shorefront ownership at the time of construction.

PINELLAS COUNTY BEC
FEASIBILITY STUDY

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DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232

REPLY TO
ATTENTION OF

PINELLAS COUNTY BEC
FEASIBILITY STUDY

INTRODUCTION

1. This report summarizes a federally funded study of the problems associated with shoreline changes in Pinellas County, Florida. Included in this report is an economic analysis of the partially completed beach erosion control project for Pinellas County with reference to extending Federal participation in periodic nourishment costs. Also included in this report are the results of engineering, environmental, economic, and institutional studies of this area.

AUTHORITY

2. This report was prepared in compliance with the resolutions adopted 4 March 1976 by the Committee on Public Works of the United States Senate and 23 September 1976 by the Committee on Public Works and Transportation of the House of Representatives, United States, which state respectively:

> RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors is hereby requested to review the beach erosion control report on Pinellas County, Florida, printed in House Document No. 519, 89th Congress, 2d Session, and other pertinent reports, with particular reference to the advisability of extending the period of Federal participation in periodic nourishment costs of the existing beach erosion control project.

> RESOLVED BY THE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION OF THE HOUSE OF REPRESENTATIVES, UNITED STATES; That the Board of Engineers for Rivers and Harbors is hereby requested to review the beach erosion control project on Pinellas County, Florida, printed in House Document No. 519, 8th Congress, 2d Session, and other pertinent reports, with particular reference to the advisability of extending the period of Federal participation in periodic nourishment costs of the existing beach erosion control project.

3. House Public Works Committee Resolution adopted 2 December 1970, sponsored by Congressman Cramer, in accordance with Section 110 of the River and Harbor Act of 1962, requested a survey of the northerly 2,000 feet of the gulf shore of Long Key, St. Petersburg Beach, Florida, and adjacent shores as may be necessary in the interest of beach erosion control, hurricane protection, and related purposes. The study has been incorporated in the Pinellas County review study.

SCOPE AND PURPOSE

4. The study is of survey scope covering the gulf shoreline of Pinellas County including Mullet Key on the extreme south end and Honeymoon Island on the north end. The study area is about 39 miles in length and extends northerly from the main entrance to Tampa Bay to the vicinity of the mouth of Anclote River (figure 1). The purpose of the study is to survey the gulf shores of Pinellas County and to examine the need and feasibility of providing measures to control beach erosion and prevent hurricane-induced flooding and to determine the extent of Federal participation in the periodic nourishment costs in those erosion control measures. Honeymoon and Caladesi Islands are included in the project review study at the request of the Florida Department of Natural Resources during the initial public meeting held at Clearwater, Florida, on 30 March 1978 and in accordance with the authorizing project document. Honeymoon and Caladesi Islands were included in the 1966 study; however, as both were privately owned and undeveloped at that time, no protective measures were recommended or authorized.

5. The study includes an economic analysis of the problem and a determination of the extent to which local interests are qualified for Federal aid under terms of Public Law 826, 84th Congress, as amended by Public Law 874, 87th Congress.

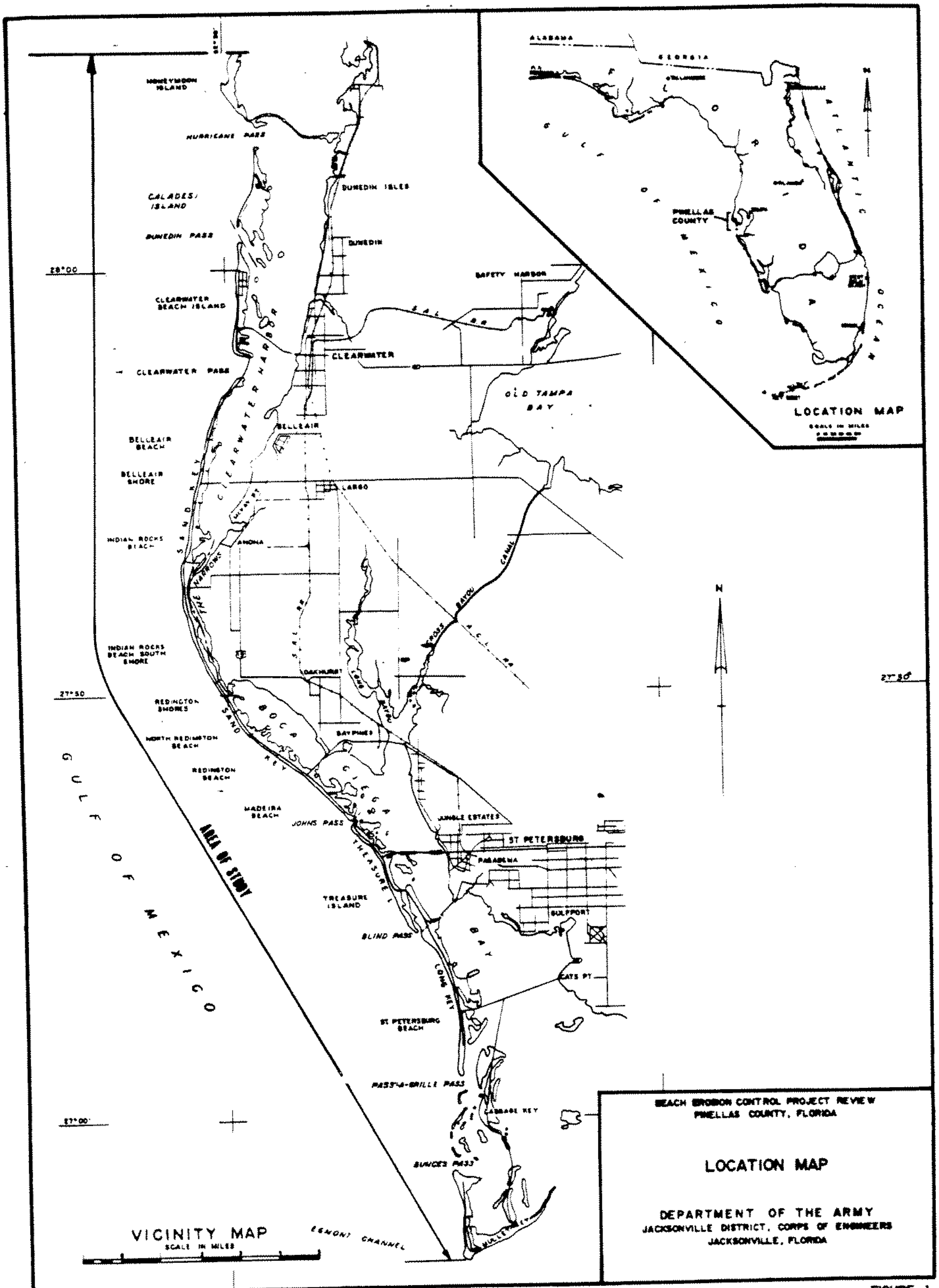
STUDY PARTICIPANTS AND COORDINATION

6. The Corps of Engineers is responsible for the conduct and coordination of the study, consolidation of information from other agencies, formulation of a plan, and preparation of the report. The Pinellas County Board of County Commissioners is the local sponsor of the study. Other agencies or organizations assisting in this investigation and providing useful information include the Environmental Protection Agency (EPA), National Oceanic and Atmospheric Agency (NOAA), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), State of Florida Department of Natural Resources (DNR), Tampa Bay Regional Planning Council, Pinellas County Board of County Commissioners, and various other Federal, State, and local agencies. The report was coordinated under E.O. 12372.

7. Coordination has been established by written correspondence and meetings since study initiation in February 1978, with the local study sponsor, the Pinellas County Board of County Commissioners. Each of those contacts has been coordinated with the Division of Beaches and Shores, Florida Department of Natural Resources. The final public meeting for the study was held on 17 May 1984 at the Pinellas County courthouse.

a. Meeting of 21 March 1978. A representative of the Corps attended a County Commission meeting on 21 March 1978 to brief the Commissioners on the status of the recently initiated beach study of the gulf shore of Pinellas County.

b. Initial public meeting 30 March 1978. By SAJEN-RC letters of 14 February 1978, arrangements were made with Pinellas County officials for the public meeting to be held in Clearwater at 7:00 p.m. Advanced public notice of the meeting was provided to appropriate congressional and State



HONEYMOON ISLAND
HURRICANE PASS
DUNEDIN ISLES
CALADESI ISLAND
DUNEDIN PASS
DUNEDIN
28°00
SAFETY HARBOR
CLEARWATER BEACH ISLAND
CLEARWATER HARBOR
CLEARWATER
CLEARWATER PASS
OLD TAMPA BAY
BELLEAIR
BELLEAIR BEACH
BELLEAIR SHORE
LARGO
SAND KEY
INDIAN ROCKS BEACH
ANONA
THE NARROWS
CROSS BAYOU CANAL
INDIAN ROCKS BEACH SOUTH SHORE
27°50
REDINGTON SHORES
BOCA CIEGA
NORTH REDINGTON BEACH
BAY PINES
REDINGTON BEACH
MADEIRA BEACH
JOHNS PASS
JUNGLE ESTATES
ST PETERSBURG
PASADENA
TREASURE ISLAND
GULFPORT
BLIND PASS
CATS PT
LONG KEY
ST PETERSBURG BEACH
PASS-A-GRILLE PASS
CABBAGE KEY
27°00'
BUNCES PASS
GULF OF MEXICO
AREA OF STUDY
VICINITY MAP
SCALE IN MILES
EGMONT CHANNEL
MULLET KEY
N
ALABAMA
GEORGIA
FLORIDA
GULF OF MEXICO
ATLANTIC OCEAN
PINELLAS COUNTY
LOCATION MAP
SCALE IN MILES
BEACH EROSION CONTROL PROJECT REVIEW
PINELLAS COUNTY, FLORIDA
LOCATION MAP
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

FIGURE 1

officials by letter of 15 February 1978. About 400 general public notices were mailed to all known interested Federal and State agencies, groups, and persons on 28 February 1978. The meeting was conducted by LTC Robert J. Waterston III, Deputy District Engineer. About 65 persons attended, including city, county, State, and Federal agency representatives as well as private property owners and individuals from various associations.

c. Final public meeting 17 May 1984. About 400 general public notices were mailed to all known interested parties. The meeting was conducted by Ed Salem, Chief of the Project Planning Division. About 35 persons attended, including city, county, State, and Federal agency representatives as well as private property owners and individuals from various associations.

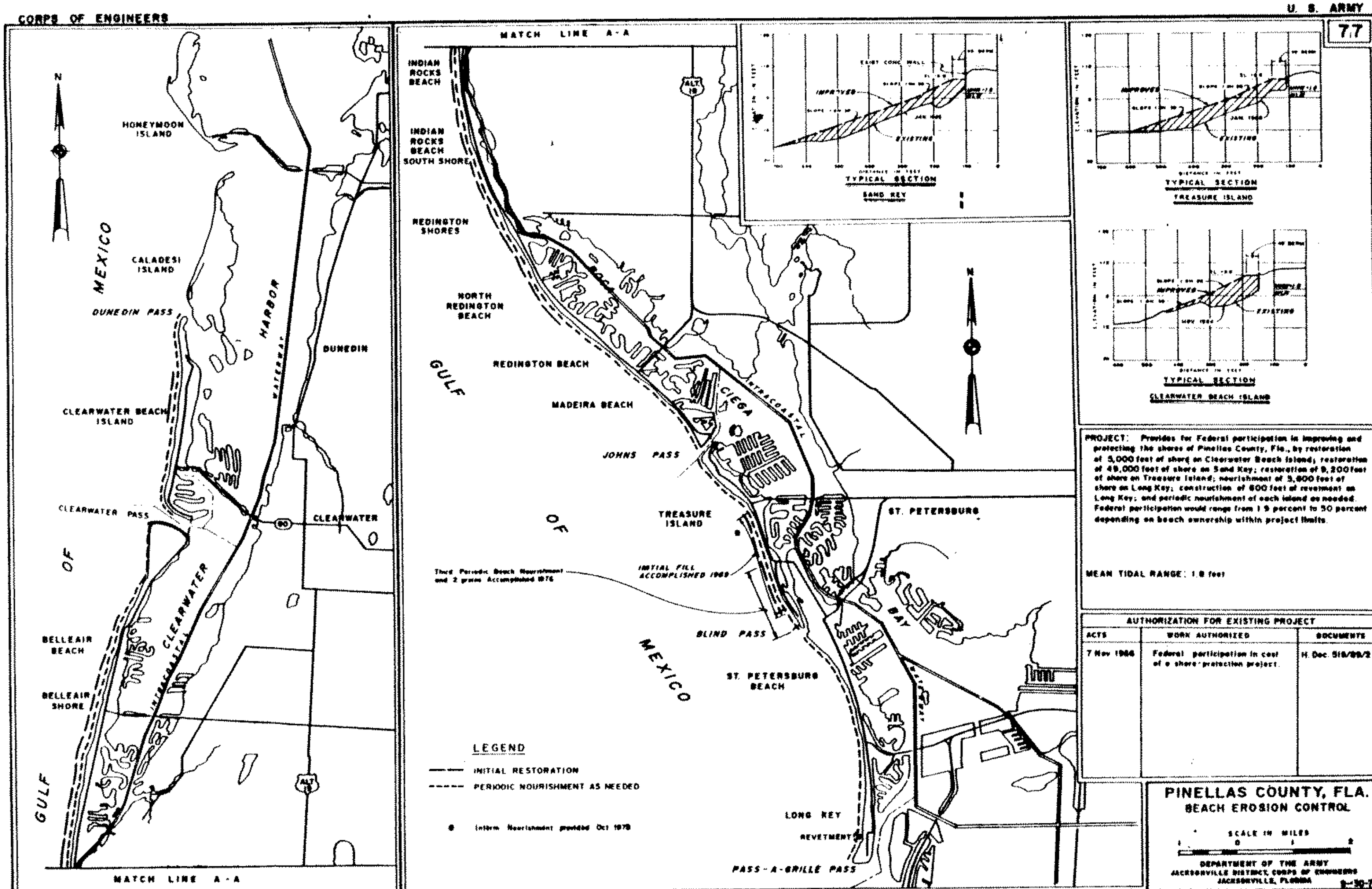
8. There has been extensive coordination with numerous agencies over the past two decades in relation to the various segments of the 1966 authorized project. Considerable effort and attention will be continued throughout the study to encourage and stimulate active public participation and involvement. Pertinent correspondence relative to the study is contained in appendix E.

EXISTING FEDERAL PROJECTS

9. Existing Federal navigation projects, consisting of the Alafia River, Tampa Harbor, Pass-a-Grille Pass, St. Petersburg Harbor, Johns Pass, Clearwater Pass, Ozona Channel, Anclote River, and the Intracoastal Waterway from the Caloosahatchee River to the Anclote River are described and illustrated in appendix A. Tampa Harbor, Pass-a-Grille Pass, Johns Pass, and Clearwater Pass are of special significance due to their locations and potential as sand sources.

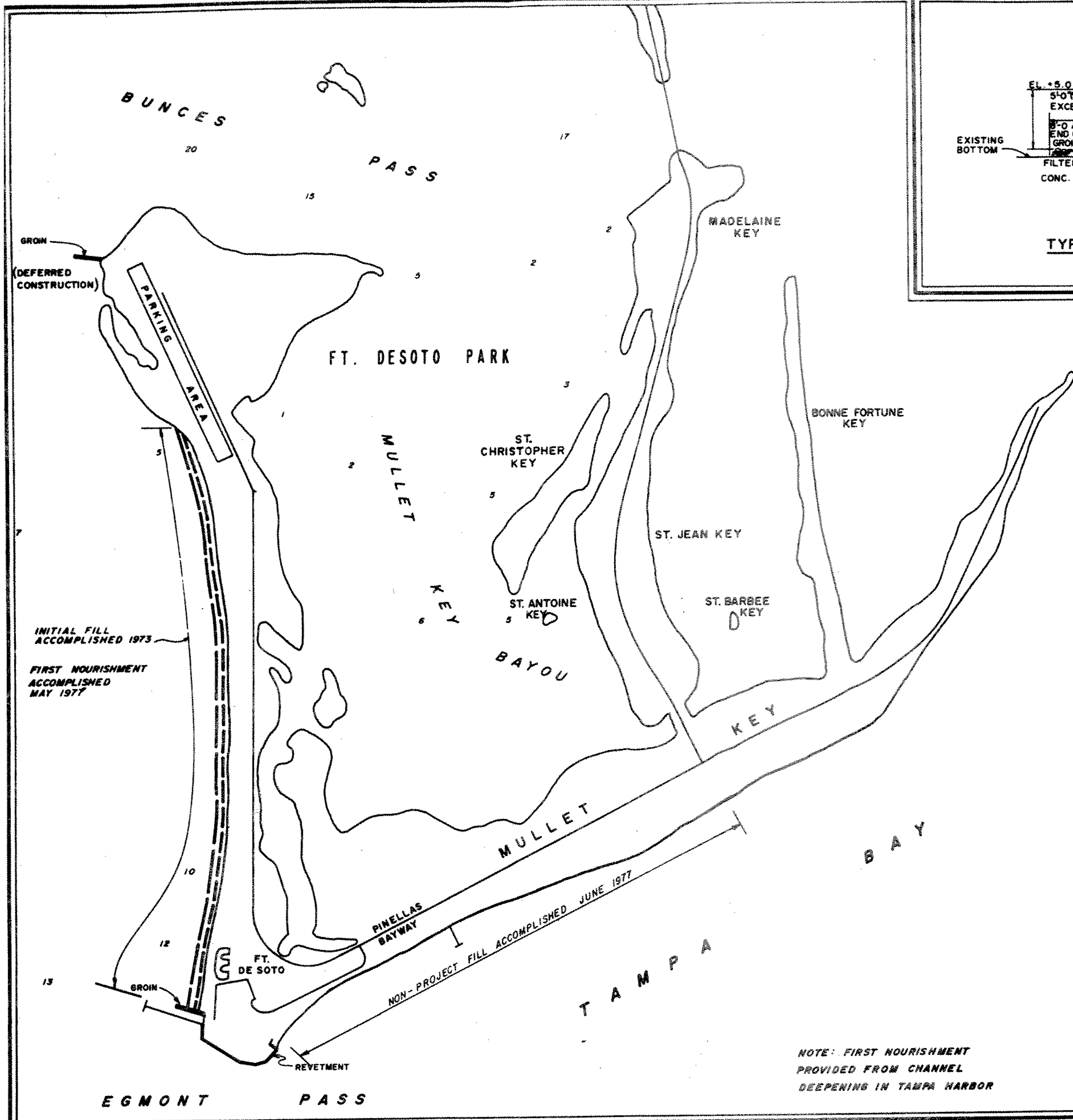
10. Existing Federal beach erosion control projects. The Corps completed an investigation of the present study area shore in 1966, excluding Mullet Key, Honeymoon and Caladesi Islands, in response to congressional resolutions adopted in 1963. The resulting project, as authorized by the 1966 River and Harbor Act, and described in House Document 519, 89th Congress, 2d session, provides for a protective beach with level berm 40 feet wide at elevation 6 feet above mean low water and gentle gulfward slopes along 1 mile of shore on Clearwater Beach Island, 9.3 miles on Sand Key, 1.7 miles on Treasure Island, and for advanced nourishment of 1.1 miles of shore and for a 600-foot revetment on Long Key. Periodic nourishment of the gulf shore of each island is also authorized as needed to compensate for future erosion losses. The project is illustrated on figure 2. A detailed summary of this project including cost allocation can be found in appendix A. A concise discussion on the project status is found on pages 27 to 30.

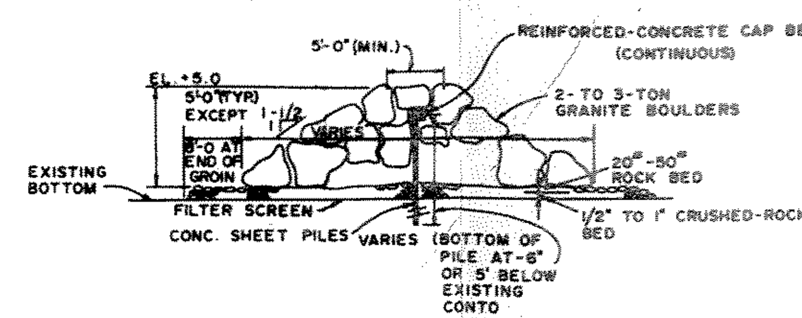
11. The Corps also completed a study of Mullet Key in 1966, in response to House Committee on Public Works resolution adopted 19 June 1963. The resulting project, as authorized by the 1966 River and Harbor Act and described in House Document 516, 89th Congress, 2d session, provides for construction of a recreational beach 6,750 feet long; a fronting protective



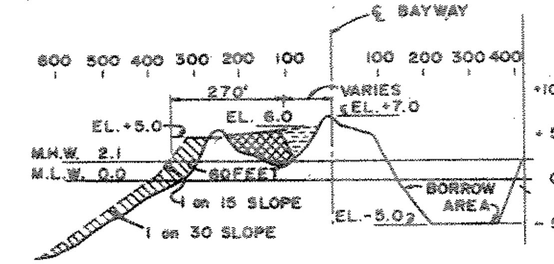
CORPS OF ENGINEERS
U. S. ARMY
77
HONEYMOON ISLAND
CALADESI ISLAND
MEXICO
DUNEDIN PASS
HARBOR
WATERWAY
DUNEDIN
CLEARWATER BEACH ISLAND
CLEARWATER PASS
CLEARWATER
OF
INTRACOASTAL
BELLEAIR BEACH
BELLEAIR SHORE
GULF
MATCH LINE A-A
INDIAN ROCKS BEACH
INDIAN ROCKS BEACH SOUTH SHORE
REDINGTON SHORES
NORTH REDINGTON BEACH
REDINGTON BEACH
MADEIRA BEACH
JOHNS PASS
TREASURE ISLAND
CIEGA
BAY
ST. PETERSBURG
BLIND PASS
ST. PETERSBURG BEACH
LONG KEY
REVETMENT
PASS-A-GRILLE PASS
INITIAL FILL ACCOMPLISHED 1969
Third Periodic Beach Nourishment and 2 groins Accomplished 1976
LEGEND
INITIAL RESTORATION
PERIODIC NOURISHMENT AS NEEDED
Interim Nourishment provided Oct 1978
TYPICAL SECTION
SAND KEY
TYPICAL SECTION
TREASURE ISLAND
TYPICAL SECTION
CLEARWATER BEACH ISLAND
IMPROVED
EXISTING
PROJECT: Provides for Federal participation in improving and protecting the shores of Pinellas County, Fla., by restoration of 5,000 feet of shore on Clearwater Beach Island; restoration of 49,000 feet of shore on Sand Key; restoration of 9,200 feet of shore on Treasure Island; nourishment of 5,800 feet of shore on Long Key; construction of 600 feet of revetment on Long Key; and periodic nourishment of each island as needed. Federal participation would range from 19 percent to 50 percent depending on beach ownership within project limits.
MEAN TIDAL RANGE: 1.8 feet
AUTHORIZATION FOR EXISTING PROJECT
ACTS
WORK AUTHORIZED
DOCUMENTS
7 Nov 1966
Federal participation in cost of a shore-protection project.
H. Doc. 519/89/2
PINELLAS COUNTY, FLA.
BEACH EROSION CONTROL
SCALE IN MILES
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

FIGURE 2

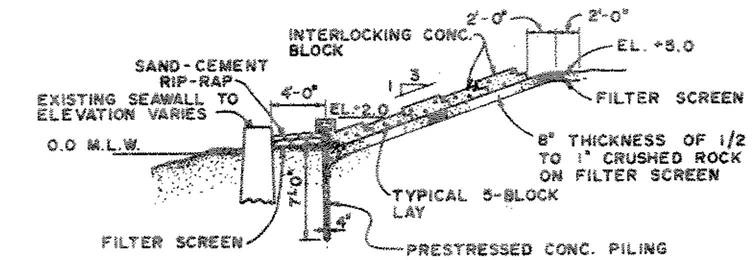




TYPICAL SECTION OF GROIN



TYPICAL SECTION



TYPICAL SECTION OF REVETMENT

PROJECT: Provides for Federal participation in improving and protecting the shore of Mullet Key, Fla., by the construction of a recreational beach 6,750 feet long; a fronting protective beach 60 feet wide; an anchor groin 420 feet long at the south end of the protective beach; a deferred groin at the north end of the protective beach if needed and justified; a revetment 1,150 feet long around the southwest point of the key from the shore end of the south groin; and periodic nourishment of the protective beach and the remainder of the gulf and south shores of the keys if needed. Federal participation would be 70 percent of the first cost and nourishment costs for an initial period of 10 years.

MEAN TIDAL RANGE: About 1.6 feet at entrance to Tampa Bay.

AUTHORIZATION FOR EXISTING PROJECT

ACT	WORK AUTHORIZED	DOCUMENT
7 Nov. 1966 (RH Sec. 101)	Federal participation in cost of a shore-protection project.	H. Doc. 516/89/2

MULLET KEY, FLA.
BEACH EROSION CONTROL

SCALE IN FEET
1000 0 1000 2000 3000 4000

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

9-30-77

FIGURE 3

beach 60 feet wide; an anchor groin 420 feet long at the south end of the beach; a deferred groin at the north end; and a revetment 1,150 feet long around the southwest point of the Key from a shore end of the south groin. Periodic nourishment of the protective beach and the remainder of the gulf and south shores of the Key, if needed, was authorized at Federal participation of 70 percent of the first cost and nourishment costs for an initial 10-year period. Initial nourishment was completed in 1973. The project is illustrated in figure 3.

PRIOR REPORTS AND STUDIES

12. Numerous reports bearing on the subject of beach erosion or including data on shore processes in the study area have been made by the Corps of Engineers, by private engineering firms, and by the Coastal Engineering Laboratory of the University of Florida. Those reports are summarized in appendix A.

THE REPORT AND STUDY PROCESS

13. For clarity and ease of presentation, the report is arranged into a main report, which includes an Environmental Impact Statement (EIS) and a Section 404 Evaluation Report, and supporting appendices. The main report is the basic document which describes the study and investigations conducted and provides the rationale and support for the conclusions and recommendations. The main report is intended to be of sufficient detail to permit the reader to determine the adequacy of the investigations conducted and the appropriateness of the conclusions reached. The technical appendices provide detailed backup data to support summaries found in the main report and indepth technical data where necessary. A list and description of appendices follows:

- Appendix A contains descriptions and data to support the Introduction and Problem Identification sections of the main report. Included are data on existing conditions, problems and needs, population and land use, and economic conditions.

- Appendix B contains supporting information on the formulation, assessment, and evaluation of alternatives section of the main report.

- Appendix C contains engineering investigations and design for the considered detailed alternatives.

- Appendix D contains economic costs analysis of the detailed alternatives.

- Appendix E contains pertinent correspondence relating to this study.

14. During the initial phase of this investigation, studies focused on identifying the specific areas of concern and problems being experienced. Following this, attention was placed on analyzing the problems being experienced and potential solutions to those problems. This was subsequently followed by detailed analysis and evaluation of those potential

solutions that appeared to offer the best means for reducing the problems. At various points in this process, meetings were held with the local interests and general public to discuss the study progress and findings to date and obtain public input.

15. Prior to being forwarded to Congress, this report will be reviewed by the Corps' South Atlantic Division Officer, the Board of Engineers for Rivers and Harbors, and the Office of the Chief of Engineers to insure technical adequacy and conformance to established laws and regulations. The Chief of Engineers will obtain the views of the Governor of Florida and various Federal agencies prior to forwarding this report to the Secretary of the Army. The Secretary will review the report and obtain the views of the Officer of Management and Budget (OMB) prior to forwarding the report to Congress. Once in Congress, further action by the Corps is dependent upon authorization and funding.

PROBLEM IDENTIFICATION

16. This section of the report discusses the problems and needs addressed by this study. It presents a summary of the natural and human resources in the study area as well as the development and economy of the area. In addition, a summary of the natural forces and their influence on the area is presented. Detailed information on these items may be found in appendix A.

NATIONAL OBJECTIVES

17. Federal policy on water resources planning is derived from both legislative and administrative authorities. This overall policy defines the national goals which studies involving the Federal government should address and specifies the range of measures which should be investigated as well as the impacts which should be identified. The Water Resources Council (WRC) sets the guidelines for Federal involvement in water resource planning and establishes overall procedures to be followed in Federal planning activities.

18. The "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies" (P&G) was developed by the WRC to guide Federal agencies in formulating and evaluating alternative plans for water and related land resource planning. The Federal objective of this planning is to contribute to National Economic Development (NED) consistent with protecting the Nation's environment, pursuant to National environmental statutes, applicable executive orders, and other Federal planning requirements.

EXISTING CONDITIONS (PROFILE)

19. In view of the national objectives, an inventory of the study area was conducted to determine quality and/or quantity of the existing water and related land resources of the area. The primary purpose of establishing such an inventory is to identify areas where problems exist and provide a

baseline for determining net impacts which may result from various courses of action.

LOCATION AND GENERAL DESCRIPTION.

20. Pinellas County is on the gulf coast of Florida, about midway on the peninsula. It extends northerly about 39 miles from the main entrance to Tampa Bay to the vicinity of the mouth of Anclote River. The Pinellas County coast consists of numerous keys or barrier islands extending almost north-south in the northerly half and northwest-southeast in the southerly half of the county. The barrier islands are narrow and low, ranging in width from about 200 to 2,000 feet. Elevations of the barrier ridge vary from 5 to 10 feet above mean low water. * The keys and intervening passes are described from north to south in the following paragraph.

21. Honeymoon Island is a low, flat island with about 2.6 miles of gulf frontage. It is the northernmost of the Pinellas County barrier islands and is accessible by a causeway constructed in 1966. Except for an area on the causeway entrance, the island is virtually undeveloped. However, the State is in the process of developing the island as a State Recreation Area.

22. Hurricane Pass separates Honeymoon and Caladesi Islands. Formed during the 1921 storm, the pass is about 2,000 feet wide and has depths ranging from 1 to 15 feet, m.s.l. A Federal Section 107 navigation study for Hurricane and Dunedin Passes recommended Federal participation in maintaining both passes. Maintenance material would be suitable for beach nourishment.

23. Caladesi Island has been developed as a State Park accessible by boat only. The island is low, flat with about 2.1 miles of gulf frontage. The park has been fully developed to include wilderness areas as well as recreational space.

24. Dunedin Pass. Formerly called Big Pass, Dunedin Pass separates Clearwater Beach Island from Caladesi Island. The Pass is about 400 feet wide at its narrowest point. The Section 107 navigation study recommended Federal participation in maintenance of the pass.

25. Clearwater Beach Island. Clearwater Beach Island is about 3.1 miles long and averages about 1,200 feet in width. Natural elevations are generally under 10 feet, m.l.w. Access to Clearwater Beach Island is by causeway and bridges from the mainland and from Sand Key, across Clearwater Pass. The island is part of the city of Clearwater and has been highly developed as a resort and residential area.

26. Clearwater Pass. The existing Federal navigation project for Clearwater Pass provides for: a channel 10 feet deep and 150 feet wide from the Gulf of Mexico through the pass, thence 8 feet deep and 100 feet wide eastward to the authorized Intracoastal Waterway; a side channel 8 feet deep

*Unless otherwise indicated, all stages and elevations throughout this report refer to mean low water datum.

and 100 feet wide from the inner channel northward to the Clearwater Island Marina, with a turning basin 8 feet deep, 100 to 450 feet wide, and 850 feet long. The project is complete. Maintenance dredging material has been used to nourish the adjacent beaches on Sand Key and Clearwater Island.

27. Sand Key. Bounded on the north by Clearwater Pass and on the south by Johns Pass, Sand Key is a narrow, low, arc-shaped island about 14.2 miles long. The island varies in width from about 200 feet at the narrows, near the middle, to about 2,000 feet. Natural ground elevations are generally below 10 feet. Access to Sand Key is by numerous bridges from the mainland and from Clearwater Beach Island and Treasure Island. Sand Key has portions of nine municipalities located within its borders. The general development of the island is resort and residential.

28. Johns Pass is about 600 feet wide, with a maximum depth of about 20 feet. The pass proper is about 1,500 feet long. Johns Pass is reported to have been cut through the barrier island during a severe tropical storm in 1848. A Federal navigation project for improving Johns Pass was authorized in 1964 under terms of Section 107 of the 1960 River and Harbor Act. The project provides for an entrance channel 10 x 150 feet across the gulf bar, thence 8 by 100 feet into the pass, thence 6 by 100 feet to the Intracoastal Waterway. The project is complete. Maintenance dredging material has previously been placed on the beach north of the pass.

29. Treasure Island is a long, narrow, low island bounded on the north by Johns Pass and on the south by Blind Pass. It is about 3.5 miles long and averages about 1,500 feet in width. Natural elevations along the island are generally below 8 feet. Access to Treasure Island is by bridges from the mainland and from Sand Key and Long Key. Treasure Island is highly developed as a tourist and residential community.

30. Blind Pass is about 200 to 750 feet wide and about 7,000 feet long. Depths in the pass vary from 1 to 9 feet. The pass connects Boca Ciega Bay to the Gulf of Mexico. Blind Pass, except for a short segment at the entrance, runs obliquely almost in a north-south direction. Historically, the pass has been unstable with a secondary entrance at the north end opening and closing several times. The pass completely closed on about 19 April 1978. The pass was opened again in the fall of 1979 because of its use as a borrow area for the initial fill for the Long Key beach nourishment project. The 1983 nourishment of Treasure Island used Blind Pass as a borrow source.

31. Long Key. The gulf shoreline of Long Key is about 4.1 miles in length. Long Key is a low, narrow island with natural ground elevations generally between 5 and 10 feet. Access to Long Key is by two bridges from the mainland and a bridge from Treasure Island. Long Key has been highly developed into resort and residential areas.

32. Pass-a-Grille Pass has two entrance channels separated by Shell Key. The north part of the pass, which is the main channel, is about 2,500 feet wide with depths varying from 1 to 25 feet. A Federal navigation project

for improving the north channel of Pass-a-Grille was authorized in 1964 under terms of the 1960 River and Harbor Act. The project provides for an entrance channel 10 by 150 feet across the gulf bar, thence 8 by 100 feet to the Intracoastal Waterway. The project is complete.

33. Shell Key, Cabbage Key, and Small Adjacent Keys are small, low islands with elevation just above mean high water (m.h.w.). Limited to boat access, these islands are covered with mangrove except Shell Key, which is slightly higher in elevation.

34. Bunces Pass. A natural pass on the north side of Mullet Key, Bunces Pass separates Mullet Key from the small keys mentioned above.

35. Mullet Key. A V-shaped island about 1,000 to 2,000 feet wide, Mullet Key has a 2.5-mile leg running north-south and a 3.0-mile leg running east-west into the Tampa Bay. Developed as a major public park, a Federal beach erosion control project was implemented in 1973. The project consists of a 60-foot-wide protective beach along a 6,750-foot reach with a 420-foot-long anchor groin and a 1,150-foot-long revetment at the southwest point of the Key.

NATURAL RESOURCES

36. Geology. The State of Florida occupies a portion of a much larger goegraphic unit, the Floridian Plateau. Deep water of the Gulf of Mexico is separated from deep water of the Atlantic Ocean by a partially submerged platform nearly 500 miles long and from about 250 to 450 miles wide. During geological time the plateau has been alternately dry land or covered by shallow seas. Each retreat of the sea left marine deposits which, during subsequent advances of the sea, were moved about by waves and currents to form beaches, offshore bars, and islands. During the earlier times, the mainland area of Pinellas County, most of which is now occupied by St. Petersburg, was a small island well offshore in the mouth of a very broad embayment or indentation in the coast. The last retreat of the sea to its present level occurred during the Wisconsin glacial stage, some 40,000 to 50,000 years ago. Since then, or in geologically recent times, shore processes have reshaped the broad embayment mentioned above into what is now the general bay area around Tampa, and enlarged and extended the earlier small island at the mouth to where it joins the mainland to the north. Those processes have also formed the present beaches and the numerous offshore barrier islands and shoals in the area. The low narrow keys and sand bars in the Mullet Key area are typical examples of such formations.

37. Vegetation. The natural vegetation on the mainland adjacent to the project area is primarily mangrove swamp forests and coastal marshes. Behind the mangrove border on higher ground, is a variety of vegetative types, including pines, with an understory of herbs, saw palmettos, shrubs,

and small trees. Interspersed are small hardwood forests, cypress swamps, prairies, marshes, and bay tree swamps. The barrier islands are generally vegetated by grasses, herbs, and shrubs with scrub and stands of Australian pine on older islands. Much natural vegetation has been removed with development in the area.

38. Wildlife. Because of the extensive development on many of the islands, wildlife is limited to animals such as rodents, small reptiles, and a large variety of passerine, shore, and wading birds. The study area encompasses a variety of coastal and estuarine habitat types and consequently supports a rich variety of fishes and invertebrates.

39. Climate. The climate of Pinellas County is subtropical. Average annual rainfall in the project area is approximately 53 inches. Average January temperatures are 64°F and July temperatures average 82°F. Tropical storms occur during the fall, winter, and spring months and generate heavy waves, tides, and currents that cause damage to the study area beaches. Such storms usually originate in the Gulf of Mexico, with wind velocities varying from 20 m.p.h. up to hurricane force.

40. Threatened or endangered species. Species considered threatened or endangered by the Fish and Wildlife Service which may occur in the project area include the green, loggerhead, and leatherback sea turtles, brown pelican, manatee, and bald eagle. There is no designated critical habitat in the study area.

41. Archeological and historical. There are several known sites of historic or archeological significance along the Pinellas County gulf shore. The State Division of Archives, History, and Records Management and Heritage Conservation and Recreation Service, Department of Interior have been notified and their comments requested.

42. Water quality. Under Florida Administrative Code (F.A.C.) 17-3, waters of the State are classified I through V, with Class I waters being high quality fresh waters used for public drinking supplies and Class V being lower quality waters in industrial areas. The waters of Pinellas County are currently classified as Class III excepting those areas primarily along the County's eastern coast and in the vicinity of Mullet Key, which are Class II. Class III waters are suitable for recreation and propagation and management of fish and wildlife. Class II waters are either actually or potentially suitable for shellfish propagation and harvesting. A series of separate criteria for each classification has been established covering standards for levels of dissolved oxygen, bacteria, and various relevant pollutants.

43. In addition, Pinellas County is designated as Aquatic Preserve created under the provisions of Chapter 258, Florida Statutes. Therefore, the waters of Pinellas County have been designated outstanding Florida waters under F.A.C. 17-3.041.

DEMOGRAPHIC SURVEY *

44. Density. The second smallest area and the third largest population combine to make Pinellas the most densely populated county in Florida. The resident population of Pinellas County from the 1980 census was 728,409.

45. Age. The recreation-retirement orientation of the community has attracted a large number of immigrants, primarily retired or semi-retired persons in the age group 55 years old and over. The resulting age structure shows much higher proportions in the older age groups and much lower in the younger age groups. Compared with the national population, young adults and persons 65 years old and over show the greatest deviation. In 1975, persons 65 and over accounted for 33.7 percent of the Pinellas County population compared with 10.7 percent of the national population.

46. Sex. The high proportion of the population that is 65 years old and over is the principal reason for Pinellas County having a higher proportion of females, 54.0 percent, than the nation, 51.3 percent.

47. Race. Though the black population of Pinellas exhibits a substantial growth from both natural increase and migration, its proportion of the total population is declining because white in-migration is approximately 50 times greater numerically. Presently, the black proportion is estimated to be 7.7 percent compared with 11.6 percent nationally.

48. Education. The educational attainment of Pinellas residents is comparable with the national population. The tendency toward less formal education in older groups is largely offset by a tendency for migrating population to be better educated.

49. Households. The average household size in Pinellas (2.25 persons per household in 1980) is one of the three smallest of all Florida counties and 13 percent smaller than the 1980 State average of 2.55 persons per household 1/. The principal cause is the large number of one-person and two-person households among the elderly portion of the population.

50. Migration. Growth of the Pinellas population over the last decade and a half is attributable solely to a new in-migration. In 1976, over 5,000 new residents were needed just to offset the excess of deaths over births. When statistics on gross migration for Pinellas County are combined with the negative natural increase, it is revealed that more than one-third of all Pinellas residents have resided here less than 5 years. Among the qualities that attract in-migrants to Pinellas County are climate, recreational potential, employment, living costs, lifestyle, and relatives or friends already residing here.

*SOURCE: Pinellas County Planning Department.

1/ Source: U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population: Population and Households by States and Counties, Supplementary Report.

51. Forecast. Increasing urbanization of the Pinellas peninsula will likely modify some of these qualities and lead to a long-term gradual reduction in the rate of growth as the limit of residential saturation is approached. Currently, the combination of permanent and seasonal residents is approximately 1.05 million. The limit of residential saturation within present land use regulations is forecast to be approximately 1.5 million.

ECONOMY AND DEVELOPMENT*

52. Income. Personal income per capita for the United States, Florida, the Tampa-St. Petersburg SMSA[1/] and Pinellas County is shown in table 1. Per capita income in the State has been consistently lower than the national level even though significant gains were made prior to the recessionary period of the mid-1970's. Both State and SMSA per capita incomes rose by 130 percent during the 1970-1979 period although per capita income within the SMSA has continuously lagged behind State levels. Residents of Pinellas County have been at a relative advantage within the SMSA and compared to the State average.

TABLE 1

Personal Income Per Capita

	United States	Florida	SMSA	Pinellas
1970	$3,911	$3,698	$3,544	$3,804
1971	4,149	4,007	3,804	4,082
1972	4,513	4,461	4,226	4,538
1973	5,002	4,988	4,731	5,089
1974	5,449	5,341	5,091	5,422
1975	5,867	5,634	5,431	5,833
1976	6,425	6,094	5,843	6,342
1977	7,086	6,733	6,501	7,114
1978		7,591	7,300	7,989
1979		8,521	8,173	9,007
% change 1970-1979		130.4	130.6	136.8

SOURCE: Statistical Abstract of the United States, 1978. Florida Statistical Abstract, 1981 and 1979.

* Source: Pinellas County Planning Department

1/ The Tampa-St. Petersburg Standard Metropolitan Statistical Area (SMSA), as defined by the U.S. Department of Commerce, includes Hillsborough, Pinellas, and Pasco Counties.

53. Employment. The Pinellas County economy has historically been dominated by the service and trade industries. This is particularly true with respect to employment, although efforts aimed at strengthening and diversifying the County's economic base have begun to produce some positive results. The employment composition in Pinellas County, as compared to SMSA, state and national figures, is shown in table 2 for the years 1975 and 1979.

54. Employment in Pinellas County has always been disproportionately concentrated in the trade (particularly retail trade) and service sectors where 52.5 percent of all nonagricultural employment occurs. This figure is relatively high compared to national employment in these industries (41.6 percent) but appears to have stabilized over the last few years. Employment in manufacturing has increased from 12.9 percent to 14.7 percent of total nonagricultural employment over the same period of time, while the percentages have decreased slightly for construction and transportation, communications and utilities. Although actual employment has been increasing in all categories, employment is still dominated by the traditional sectors.

TABLE 2
NON-AGRICULTURAL EMPLOYMENT
(IN PERCENT)

Industry	U.S.		Fla.		SMSA		Pinellas County	
	1975	1979	1975	1979	1975	1979	1975	1979
Manufacturing	23.8	24.0	11.8	13.5	13.4	13.8	12.9	14.7
Construction	4.5	5.0	6.8	6.7	6.8	6.7	7.0	7.1
Transportation, Communications	5.8	5.7	6.6	6.2	6.4	5.8	4.4	3.8
Wholesale & Retail Trade	22.0	22.8	26.4	25.7	28.4	27.8	28.7	27.5
Finance, Insurance & Real Estate	5.5	5.5	6.7	7.1	6.9	7.3	8.1	8.6
Services	19.2	18.8	21.6	22.3	21.6	22.7	24.6	25.0
Government	19.2	18.2	20.0	18.5	16.4	15.9	14.3	13.3

Source: Statistical Abstract of the United States, 1976.
Florida Statistical Abstract, 1976

55. Tourism. It is evident from the increasing number of persons employed in the trade and service sectors that tourism plays an important role in the economy of Pinellas County. Growth and development have been, and

still are, integrally related with the tourist industry. In 1978, an estimated 3.7 million tourists traveled to Pinellas County by air and automobile (table 3). Tourists added over $1.2 billion to the local economy, the greatest portion going for food, lodging, entertainment, and gasoline.1/

TABLE 3

PINELLAS COUNTY TOURIST, 1978 1/

(AIR AND AUTO ONLY)

First Quarter	1,081,800
Second Quarter	903,100
Third Quarter	830,500
Fourth Quarter	863,600
Total	3,679,000

56. In 1977, there were 798 licensed hotels and motels and over 1,700 licensed food service establishments in Pinellas County. Tourist related industries (hotels and other lodging places, amusement and recreation, automotive dealers and service stations, eating and drinking places and miscellaneous shopping goods stores) employ almost 37,000 persons and have a combined annual payroll over $200 million.2/ Indirect benefits to the local economy are much greater. In all likelihood tourism will continue to play an important part in shaping the future of the Pinellas County economy.

57. Transportation. Major highways into the area include U.S. 19, U.S. 41, U.S. 301, and Interstates 75 and 4. Access is also available by Tampa International Airport and direct rail connections. Tampa Harbor is the major west coast port facility for the State.

58. Shoreline Development. Shoreline development in Pinellas County is generally one of two types: park area or highly developed resort and residential area. Honeymoon and Caladesi Islands and Mullet Key are examples of park areas. Clearwater Island, Sand Key, Treasure Island, and Long Key are highly developed islands.

1/ St. Petersburg Times/Evening Independent Research Department, Suncoast 1980.

2/ U.S. Department of Commerce, Bureau of the Census, County Business Patterns, 1977.

59. The State acquired titled to the southerly 2,500 feet of gulf frontage on Honeymoon Island in 1974 and has since obtained the remaining parcels. Currently, the State is developing Honeymoon Island into a State Recreation Area as part of the park system. Access to the area is via Dunedin Causeway. Caladesi Island was acquired by the State in 1966. This island is a State Park accessible by private boat or ferry. Mullet Key, the southerly most island in Pinellas County, has been fully developed as a major public park by the county. Mullet Key is the site of Fort DeSoto.

60. The barrier islands of Clearwater Beach Island, Sand Key, Treasure Island, and Long Key are highly developed resort, tourist, and residential areas. Portions of 11 incorporated communities are found on the islands. Each community has shops, hotels, motels, apartments, and other service establishments devoted to the accommodation and entertainment of the numerous visitors to this resort area. The communities are popular summer and winter resorts. Additionally, these islands have numerous shore protection structures including seawalls/bulkheads, groins, jetties, and revetments. A more detailed inventory of these structures is found in appendix A.

PROBLEMS AND NEEDS

61. The problems and needs addressed by this study concern shoreline erosion caused by natural forces, particularly severe storms that result in loss of land, damage to development, and loss of suitable beach for recreation. These problems and needs are discussed in the following pages, along with an indication of improvements desired by local interests. Appendix A provides additional details on the problems and needs addressed.

NATURAL FORCES

62. Whether a shoreline erodes, accretes, or remains stable, depends upon various interrelated phenomena. Driving forces such as winds, waves, and currents combine to provide the energy that shapes the coastline in the study area.

63. Winds. Prevailing winds are from the northeast and north during the winter months; during the remainder of the year they are predominantly from the east and south. Plate 1 shows a wind diagram for the Tampa area compiled from data furnished by the U.S. Weather Bureau at that station. The percentage of time that the wind blows from different directions in the offshore, shore, and Tampa areas, as indicated by available records, is tabulated on table 4.

TABLE 4

TAMPA AREA WIND RECORD

Direction	Percent		
	Offshore area	Shore area	Tampa area 1/
North	8	16	11
Northeast	13	11	14
East	17	20	24
Southeast	10	9	13
South	8	13	16
Southwest	5	8	3
West	5	11	9
Northwest	6	11	9

1/ Period of record: 1930-36.

Yearly cumulative average winds over the gulf coast, compiled from records of the U.S. Hydrographic Office, are shown in the wind diagram on plate 1. The diagram indicates the yearly average winds that have prevailed within the 5-degree square off Pinellas County.

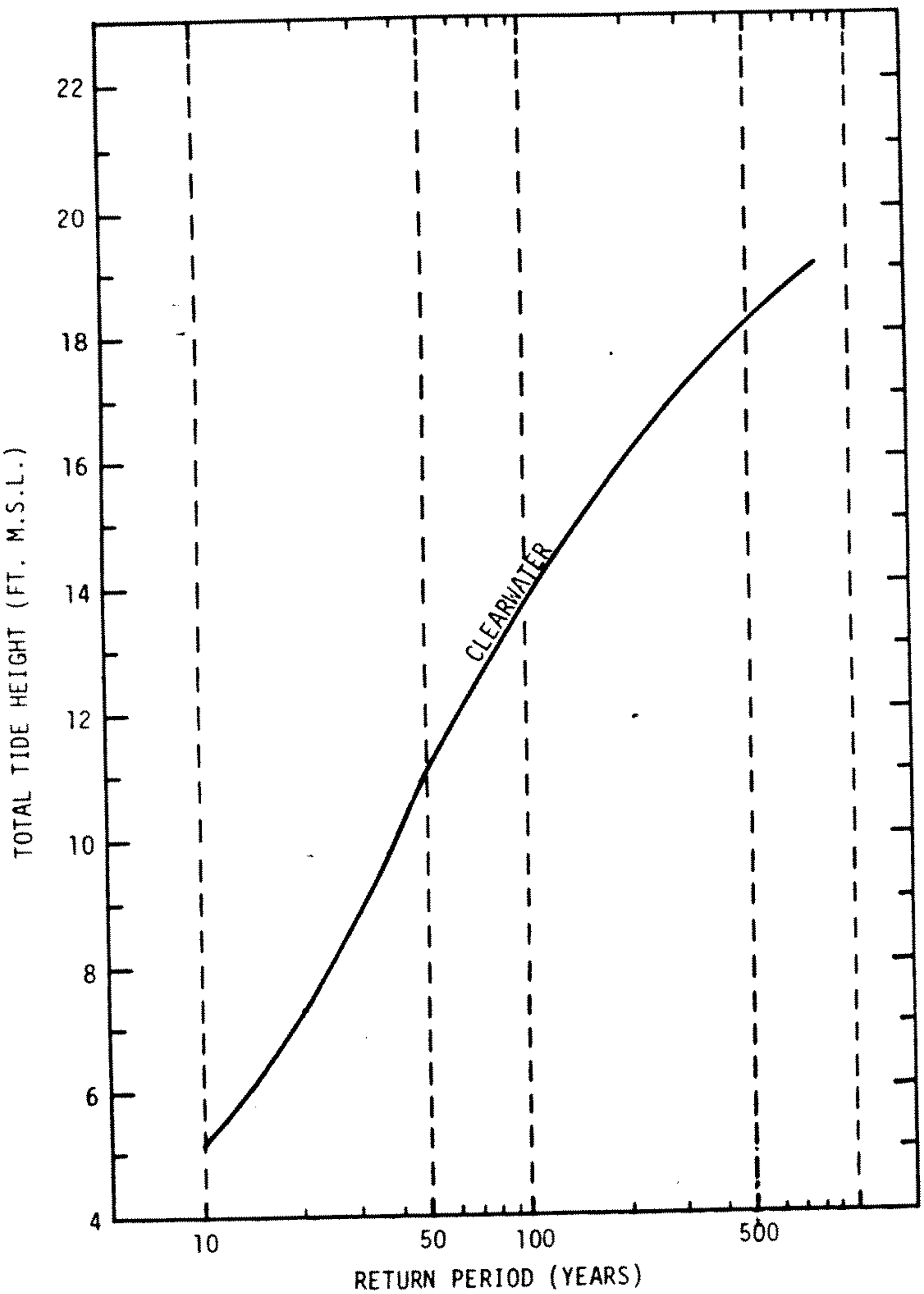
64. Swell and waves. Swell are wind-generated waves that have risen in remote areas and advanced into areas of weaker winds or calm. The gulf-swell diagram on plate 1 shows the percentage of observations during which swell from given directions occurred between 1932 and 1941 for the 5-degree square of gulf area off Pinellas County. The swell is classified according to the height of waves and are indicated on the diagram by the width of lines. The diagram indicates that only light swell 1 to 6 feet high move toward the Pinellas County shore from the northwest and south. Swell of all magnitudes from the northeast, east, and southeast are relatively much more frequent. On the swell diagram on Plate 1, it should be noted that swell from the northeast, east, and southeast directions are created by offshore winds and do not impinge on the shoreline of Pinellas County.

65. Very little gage-recorded wave data are available for the study area. However, considerable amounts of statistical summaries of wave data developed by hindcast techniques are available. A brief summary of the wave climate for the Gulf of Mexico off the study area is presented in the report on the beach erosion control study of Mullet Key.

66. Tides. Tides in the vicinity of the study area are a mixture of semidiurnal and diurnal types; that is, during part of each month two high and two low waters occur each day and during the balance of the month only one high and one low water occur each day. The range of the tide is uniformly

small, the mean averaging about 1.8 feet and the spring tide averaging 2.3 feet. Data on maximum tidal fluctuations along the study area are meager. During severe hurricanes in 1848 and 1921, storm tides are reported to have inundated the islands to depths of about 5 feet and 1 foot, respectively. This would indicate that the highest tide so far experienced there reached an elevation of about 13 feet above mean low water. Tides as high as 6 or 7 feet above that datum are considered to be very rare, with the average maximum elevation probably in the neighborhood of about 5 feet. The study area is favorably situated with respect to storm tides or storm waves, because most of the severe tropical disturbances approach the area offshore from the southeast and south rather than onshore from the southwest and west. Extreme tidal conditions of record in nearby Tampa Bay are a high tide of 10.5 feet at the upper end of that bay during a hurricane on October 25, 1921, and a low tide of -6.6 feet at the same point during a hurricane on October 8, 1910. Currents are predominantly tidal. In shallow area in the gulf and in the bays away from the passes in the study area, the currents are generally weak and to some extent are controlled in direction and magnitude by winds. Figure 4 shows the resultant total tide frequency curve on the "open coast" opposite Clearwater, Florida. The frequency values are of still water levels that would be measured in a tide gage or other enclosure, excluding wave action. The curve is from the report "Storm Frequency Analysis for the Gulf Coast of Florida," NOAA Technical Memorandum NWS HYDRO-20 of April 1975. The term "open coast" for Clearwater applied to the gulf beaches of Clearwater Beach Island and Sand Key, on each side of Clearwater Pass.

67. Currents. Currents were measured at several points in and around the entrance to Tampa Harbor, immediately south of the study area, in 1951 by the U.S. Coast and Geodetic Survey, and are published in "Tidal Current Charts of Tampa Bay" (Serial No. 743). Maximum velocities of the strengths of flood and ebb tides were 1.9 and 4.2 feet per second, respectively, in Egmont Channel; in Pass-a-Grille these velocities were 2.7 and 4.2 feet per second, in Southwest Channel they were 2.0 and 2.0 feet per second, and in Passage Key Channel, 2.7 and 3.6 feet per second. Using the average it was found that under normal conditions maximum ebb velocities exceed maximum flood velocities by over 50 percent. The considerable dominance of the ebb flow is of significance because it is chiefly responsible for the formation of the shoals and bars offshore of the mouths of the passes, rather than inshore in the bays. Currents were also measured offshore in the gulf during the 1951 observations as the passes. The measuring point was about 4 miles offshore in water about 30 feet deep. The observations were made over a period of 70 hours. Winds blew generally from the northwest, northeast, and southeast. During 18 hours of northwest winds with velocities of about 0.7 foot a second were recorded. During 8 hours of light northwest winds, current direction was essentially the same, but velocities slowed to about 0.4 foot a second. Northeasterly winds of 5 to 8 miles an hour for 5 hours and southeasterly winds of 8 to 15 miles an hour for 7 hours of the period of observation, tended to cause currents to flow slightly west of south at velocities of 0.3 to 0.6 foot a second. The period of observation was too short to obtain effects of southwesterly and westerly winds.



TOTAL TIDE FREQUENCY CURVE ON THE OPEN COAST AT CLEARWATER, FLORIDA

FIGURE 4

68. Storms and their effects. Tropical storms with wind velocities ranging from 20 miles an hour to that of hurricane force are the chief generators of the heavier waves, currents, and wind tides in the study area. Local frontal storms of unusual intensity are also generators but the effects are relatively less.

69. Hurricanes. The paths of hurricanes which have passed within 50-mile and 150-mile radii of Pinellas County are shown on plate 1. Since 1830, a total of 51 known hurricanes and tropical disturbances have passed within a 50-mile radius of the general area. Of that total, 23 were classified as being of hurricane intensity and 28 of less-than-hurricane force. Since 1900, 16 hurricanes and 19 tropical disturbances have passed within 50 miles of the area. The accuracy of data for the period 1830 to 1900 is questionable. The relative frequency of hurricanes and tropical disturbances in the study area for selected periods is given in table 5. Appendix A presents data on major hurricanes that have affected the area, and, to the extent available, on local frontal storms that have caused considerable erosion and damage.

TABLE 5

HURRICANE FREQUENCY

Period	Hurricanes		Hurricanes and tropical disturbances	
	Number	Relative frequency	Number	Relative frequency
1830-1900	7	1 in 10 years	16	1 in 4 1/2 years
1900-1964	13	1 in 5 years	29	1 in 2 years
1830-1964	20	1 in 6 1/2 years	45	1 in 3 years
1964-1977	3	1 in 4 1/3 years	6	1 in 2 1/4 years

70. Sea Level Rise Effect. Within the last few years strong evidence has been produced of a small general rise in sea level along the coasts of the United States. The indicated rate of rise along the gulf coast of Florida is about .01 foot a year. It thus appears that the shorelines of this and other coastal areas may again be entering a cycle of submergence instead of one of emergence as in the recent geological past. Melting of the polar ice caps appears to be the primary cause of the rise in sea level.

SHORE MATERIALS

71. Littoral Materials. The repeated submersion and emersion of the Floridian Plateau during fluctuation of sea level in the ice ages left a series of marine deposits containing large amounts of quartz sand and shell in varying mixtures. In the shore and nearshore zones of Pinellas County, sorting action of the waves and the tidal currents have removed most organic

matter to deeper water so that the surface material is practically all sand and shell. Subsurface material in the area contains some organic matter. This makes it less suitable for beach replenishing because of the loss factor during construction. The source of littoral materials in the area is not definitely known. They apparently are derived partly from the offshore bottom and partly from erosion of other beaches and islands in the area and not from northern sources as is suggested along the Atlantic coast.

72. Surface Sand Samples. Surface sand samples and core borings were obtained on the study area. Tabulation of median diameters of the samples collected and detailed information concerning beach material are contained in appendix C.

SHORE PROCESSES

73. Shoreline changes. Comparative positions of the shoreline over the period of record have been computed and are presented in appendix A. The basis for comparison are surveys made by the U.S. Coast and Geodetic Survey in 1873, 1926, and 1939, by the Florida Department of Natural Resources in 1975 and 1977, and by the Corps of Engineers in 1950 and 1979. Changes in shoreline positions over the periods 1873 to 1950 and 1950 to 1979 are tabulated in table A-12 of appendix A. Shoreline changes in the study area between 1950 and 1979 were influenced to a large degree by local interests' actions in providing beach fill, jetties, groins, and other works. In addition, the Federal beach erosion control project for Treasure Island was constructed in 1969 and has been nourished four times. The shoreline of Clearwater Beach Island receded an average of 121 feet from 1973 to 1950 and advanced an average of 175 feet from 1950 to 1979. Between 1950 and 1979, the northern shoreline of Sand Key receded an average of 83 feet while the southern end advanced an average of 83 feet. The shoreline of Treasure Island advanced an average of 151 feet over the period 1950 to 1979. The shoreline of Long Key generally advanced between 1950 and 1978, except an unstable area immediately south of Blind Pass. The advance of the shore at the south end of the island was due to accretion at the Pass-a-Grille Channel jetty. Details are presented in appendix A.

74. Offshore depth changes. Comparisons of offshore depth changes are based on surveys of 1881-1883 by the Coast and Geodetic Survey and the survey of 1950 by the Corps of Engineers. Details are shown in appendix A. Changes in the position of the 6-, 12-, and 18-foot depth contours from 1881-1883 to 1950 are given in table A-14 of appendix A. In the reach off Clearwater Beach Island for the period 1881-1883 to 1950, the 6- and 18-foot depth contours receded landward an average of 416 feet and 536 feet, respectively. Available data for the 12-foot depth contour show that for 1 mile of shore at the south end of the reach between Clearwater Pass and Blind Pass (Sand Key) for the same period above, the 12- and 18-foot depth contours receded landward an average of 403 feet and 756 feet, respectively. The 6-foot depth contour in that reach receded landward about 324 feet except at the Belleair Beach and Belleair Shore area where it advanced a net

average of 62 feet. In the reach off Treasure Island, the 6-foot and 18-foot contours receded landward an average of 232 feet and 424 feet, respectively. The 12-foot depth contour advanced seaward a net average of 555 feet for about two-thirds of the reach and receded a net average of 713 feet for the remaining 1 mile in that reach. In the reach off Long Key the 6-foot depth contour advanced an average of 284 feet in the northern two-thirds and receded an average of 1,743 feet in the southern third. The 12-foot depth contour advanced an average of 260 feet in the northern third and receded an average of 292 feet in the middle third. The 18-foot depth receded an average of 833 feet over the northern half of the island. Data on the 12-and 18-foot depth contours are not available for the southern part of Long Key. Survey information for the period prior to 1974 was not available for Honeymoon and Caladesi islands.

75. The 1979 profiles for Honeymoon Island did not extend to the 6-foot depth contour. Off Caladesi Island, the 6-foot contour receded landward 83 feet over the north portion of the island and receded 130 feet over the southern end for the period 1974-1977. Off Clearwater Beach Island, the 6-foot depth contour receded landward 458 feet over the period 1950-1979. Data on the 12-foot depth contour are not available. Off Sand Key the 6- and 12-foot contours receded landward 73 feet and 200 feet, respectively. The 6-foot depth contour at the south end advanced about 65 feet. Off Treasure Island the 6- and 12-foot depth contours advanced 190 feet and receded 344 feet, respectively. Off Long Key, the 6- and 12-foot depth contours advanced seaward about 128 feet and 286 feet, respectively. The 1979 profiles generally did not reach the 18-foot depth contour. Table A-15 of appendix A summarizes the data.

76. Comparative beach profiles. Profiles obtained during the survey made August 1979, were compared with those surveys in the fall of 1950. Plottings of the comparative profiles are on file in the office of the Jacksonville District Engineer. The 1979 profiles, for practical purposes duplicated the 1950 profiles in location. For Honeymoon and Caladesi Islands, surveys dated 1974 and 1978-1979 were used for comparative purposes. The survey information was obtained from the Florida Department of Natural Resources, Division of Beaches and Shores.

77. Volumetric accretion and erosion. Volumetric changes in the study area are presented in table A-16 of appendix A. The quantities shown in table A-16 and summarized briefly below are based on the comparative profiles prepared from surveys as indicated in the tables. The average annual net change at Honeymoon and Caladesi Islands was 15,200 cubic yards of erosion and 15,100 cubic yards of accretion, respectively. The average annual net change at Clearwater Beach Island was 27,200 cubic yards of accretion. The average annual net change at Sand Key was 88,300 cubic yards of erosion. The average annual net change at Treasure Island was 11,800 cubic yards of accretion. The average annual net change at Long Key was 46,600 cubic yards of accretion. The above quantities are affected by artificial fill introduced into the littoral stream and by numerous structures constructed into the nearshore zone. Due to fill placed by Federal beach nourishment project and Federal maintenance of navigation channels, and due to the fill placed by local interests which reduced the computed losses, future periodic

nourishment requirements were estimated at values higher than the losses from the reach considered for nourishment. Details are presented in appendix A.

78. <u>Littoral Transport</u>. There is no predominant direction of littoral transport evident along the Pinellas County shoreline. Available data indicate both north and south movement of material with the south movement slightly larger in quantity. It appears that drift material along the shores of the Pinellas County islands comes from one or the combination of three sources: (a) the gulf shores of adjacent islands; (b) offshore; and (c) the shoals in St. Joseph Sound north of the study area. A considerable amount of material is moved by wave action during storms. Wave action stirs the material into suspension and the currents move it either onshore, offshore, or alongshore. Over an extended period of time, a particular grain of sand is probably subjected to all three movements. The rate of drift, or alongshore movement of material, can be approximated from the rate of shoaling in the passes of the study area. Clearwater Pass has been recently improved by local interests in an effort to control scouring around the bridge pilings, and conclusive records of channel shoaling are not yet available. From an examination of available data, annual shoaling is estimated to be about 10,000 cubic yards. Estimated annual shoaling at Johns Pass is 25,000 cubic yards. At Blind Pass, about 75,000 cubic yards of material shoaled in a 2 1/2-year period (May 1958 to November 1960), reflecting a short-term average of 30,000 cubic yards annually. Shoaling at Pass-a-Grille Pass has been mostly in the bar cut which extends from 4,000 to 8,000 feet offshore and is estimated to be about 20,000 cubic yards annually. At Egmont Channel, 247,490 cubic yards of material shoaled between October 1953 and July 1962, or about 28,000 cubic yards per year. Recognizing that only a portion of the littoral drift is deposited in the passes, the net southerly drift rate along the Pinellas County shore is estimated to range from 10,000 cubic yards at the north end of the area to 50,000 cubic yards at the south end.

PRIOR CORRECTIVE ACTION

79. Prior to 1969 action to provide protection from erosion has been primarily limited to the construction of seawalls, groins, and small amounts of fill, by the various municipalities and private property owners. Some 41,000 linear feet of walls and 15,000 linear feet of groins were constructed prior to 1950. Many additional walls and groins were added immediately after a severe hurricane in September 1950. The structures were of varying types and degress of effectiveness. Since 1950, the construction of seawalls and groins has continued at a rapid rate in some places. Seawalls installed by private property owners since 1950 have been primarily of concrete construction, consisting of 7- to 8-inch slabs 12 to 18 feet long and concrete king piles. Groins constructed by private interests have been primarily of timber piles and timber and/or concrete walls. The condition and effectiveness of the seawalls and groins built since 1950 vary considerably.

80. Corrective action by the various municipalities for beach erosion control and protection prior to 1950 consisted of concrete and timber seawalls

and numerous timber groins along the frontage of Clearwater Beach, the north end of Sand Key, Indian Rocks Beach, Madeira Beach, Treasure Island, and Long Key. Also, in 1949, the City of Clearwater placed about 150,000 cubic yards of fill material, dredged from the bay behind, largely on the two city-owned beach parks. The results were reported to have been vary satisfactory for a while. Construction by the municipalities since 1950, as best as could be determined, is presented in the following paragraphs.

81. Honeymoon Island. In an attempt to develop the island in the 1960's, the southern half of the island was scraped, leveled, and filled. Three groins were constructed during this period. The existing south shore is void of vegetation and has a rocky cover of little recreational value. The northern half of the island has not been disturbed.

82. Caladesi Island. No corrective action has been provided to control erosion on Caladesi Island. This island is a State-owned park area.

83. Clearwater Beach Island. In 1949, about 150,000 cubic yards of beach fill were placed on the southern end of the island. Of that amount, 30,000 cubic yards were placed by the city on the south end of the public beach and 120,000 cubic yards were placed on private property to the south. The city's share of the cost was $5,000. In 1950, the City of Clearwater also constructed two groins at the southern end of the public property at a cost of $12,000. In 1952, a 500-foot concrete pier-groin, 300 feet of which consists of concrete-slab baffles, was built at a cost of $42,000. In 1961, the city built seven groins at a cost of $40,000. In 1963, another concrete baffle type pier groin was built by the city at a cost of $55,000. The city also placed a considerable amount of rubble and fill at the southerly end of the public property near Clearwater Pass. During 1981 and 1982, the city of Clearwater Beach constructed an 800-foot-long curved jetty at the southern end of the public beach and placed about 180,000 cubic yards of fill material in the vicinity of the jetty. This was part of an effort to stabilize the shores and channel at Clearwater Pass.

84. Sand Key. Except at Madeira Beach, most protective structures on Sand Key were provided by property owners. No details are available on the work or expenditures. At Madeira Beach in 1957, the city built 37 groins over its entire frontage. The groins are of timber piles and adjustable timber and concrete panels. In 1961, the city built a curved jetty on the north side of Johns Pass and placed about 30,000 cubic yards of fill immediately north of the jetty. Total expenditures for the groins, jetty, and fill were about $300,000. The Madeira Beach project is considered to be very successful. An annual expenditure of about $10,000 has been incurred by the city for maintenance and for placing and removing additional panels in the groins, as necessary. In 1975, the city of Clearwater Beach completed construction of a curved jetty on the south side of Clearwater Pass, at a cost exceeding 2.5 million dollars. Maintenance dredging of the Federal navigation project for Clearwater Pass in 1977 placed 186,000 cubic yards of material on Sand Key just south of the curved jetty. The city of Clearwater Beach placed about 600,000 cubic yards of material on the beach south of Clearwater Pass during 1982-83.

85. Federal Disaster Assistance Administration (FDAA) authorized work by letter to the Division Engineer dated 24 October 1972 for emergency repair of storm damage on Sand Key at Indian Rocks Beach and Indian Rocks Beach south shore, caused by Hurricane Agnes. Work consisted of placement of 400,000 cubic yards of sand fill on approximately 5 miles of beach. The work was completed in 1973. The project has been transferred to local interests for maintenance. Similarly, about 143,000 cubic yards of emergency fill were placed at Indian Rocks Beach south shore in 1969, along a mile of shore damaged by Hurricane Gladys in 1968.

86. Treasure Island. In 1960, the City of Treasure Island built 56 groins at a cost of $228,000. An additional expenditure of $35,000 was incurred that year for replacing timber panels in the groins by concrete. In 1962, a native stone, rubble-mound jetty was built on the north side of Blind Pass at a cost of $18,000. In December 1964, about 10,000 cubic yards of material at a cost of $6,500 were dredged from Blind Pass and placed on the public beach nearby.

87. The Corps completed a study of the gulf shores of Pinellas County in 1966 which resulted in the project discussed previously. Hurricane Gladys, on 18 and 19 October 1968, caused severe damage to the beaches in Pinellas County. The initial project beach fill on Treasure Island was completed in 1969 and consisted of placement of 120,000 cubic yards of emergency fill and 670,000 cubic yards of authorized project fill for a total of about 790,000 cubic yards. The sand was excavated by hydraulic pipeline dredge from Blind Pass (108,000 cubic yards) and from a borrow area located about 1,500 to 2,100 feet offshore (682,000 cubic yards) from the southern portion of the island. The beach fill area extended from 600 feet south of 77th Avenue, near the southerly end of the island, to 104th Avenue, near the middle of the island. The project was extended 2,000 feet northerly to 108th Avenue in 1971, requiring placement of 75,000 cubic yards of fill obtained from a shore connected bar at the northerly end of the island. The southerly 2,000 feet of the project beach was nourished in 1972, requiring placement of 155,000 cubic yards of fill obtained from the previous offshore borrow area. Nourishment of the southerly 1.5 miles of the gulf shore of Treasure Island was completed in September 1976, involving placement of 380,000 cubic yards of fill from the offshore borrow area. Two groins were also provided in the southerly one-fourth of that reach to reduce future nourishmment requirements. The groin at the north side of Blind Pass was raised 2.5 feet to prevent sand overtopping in 1978. The 2,000 feet of beach north of the Penguin Restaurant was nourished with 50,000 cubic yards of material in November 1978. This material was also obtained from Blind Pass. Extension of groin #2 by 130 feet and nourishment of the south end of Treasure Island with 200,000 cubic yards of material from Blind Pass was accomplished in 1983.

88. Long Key. The city of St. Petersburg Beach installed groins and a seawall at the south end of the island at a cost of $115,000. Between 1959 and 1960, a rubble-mound jetty was built at Pass-a-Grille. The cost, which included some storm repair, was about $23,000. In 1962, the jetty was extended and a concrete fishing platform was added at a cost of $36,500. An annual expenditure of $12,000 is incurred by the city for beach erosion control purposes. In 1968, an unknown amount of sand was dredged from Blind Pass

and placed just south of the pass by the city. In 1974, the jetty on the south side by Blind Pass was extended 171 feet, for a total length of 261 feet, by the city. In 1975, local interests in cooperation with the city placed two kingpile groins and a beach fill of 75,000 cubic yards just south of the pass. Within 2 years the shoreline where the fill was placed was eroded back to its 1975 position.

89. The inital project beach fill on Long Key was completed in March 1980 and consisted of placement of 143,000 cubic yards on 2,800 feet of shoreline at the north end of the island. In addition, 100,000 cubic yards of advance nourishment was placed just offshore to act as a partial breakwater at the same time act as a source of sediment to the beach.

AUTHORIZED PROJECT WORKS

Mullet Key.

90. A beach erosion control project authorized by Congress in 1966 was initially completed in 1973 along the gulf shore of Mullet Key, and described in House Document 516, 89th Congress, 2d session. The total Federal cost of the project through fiscal year 1975 was $436,201. Nourishment of the gulf shore with 750,000 cubic yards was completed in May 1977 from material obtained from the Tampa Harbor dredging project. Likewise, the south shore was nourished (completed June 1977) with material from the same project (350,000 cubic yards).

Pinellas County.

91. The BEC Project was authorized in Public Law (PL) 89-789 (passed 7 November 1966) for construction substantially in accordance with recommendations of the Chief of Engineers (COE) in House Document (HD) No. 519, 89th Congress 2nd Session. The project provides for the following:

a. Restoration of 5,000 feet of beach at Clearwater Beach Island;

b. restoration of 49,000 feet of beach at Sand Key;

c. restoration of 9,200 feet of beach at Treasure Island;

d. construction of 600 feet of revetment at Long Key; and

e. advanced nourishment of 5,600 feet of Long Key and periodic nourishment of each island, as needed.

92. The COE also stipulated that the works on each of the four islands could be constructed together or independently of each other as four separate projects, provided that, prior to construction, local interests furnish all necessary assurances.

Status of the Pinellas County Project.

93. Work accomplished under the authority of the existing project is summarized in table 6 and discussed in the following paragraphs.

TABLE 6

SUMMARY OF FEDERALLY-AUTHORIZED BEC WORKS - PINELLAS COUNTY

Date	Action
1966	Corps completed BEC study of Pinellas County. Project approved by River and Harbor Act of 7 November 1966.
1968	Shore damage by Hurricane Gladys of 18 and 19 October.
1969	Initial 790,000 cubic yards of fill placed at Treasure Island segment; 108,000 cubic yards from Blind Pass and 682,000 cubic yards from offshore. Fill extended from Station 0+00 to Station 92+00.
1971	Project at Treasure Island extended 2,000 feet (from Station 92+00 to Station 112+00). Extension required; 75,000 cubic yards of material which was taken from a bay at the north end of the island.
1972	Southerly 2,000 feet of project beach at Treasure Island was nourished with 155,000 cubic yards of material in 1972. Material was from offshore borrow area.
1976	The southerly 1.5 miles of Treasure Island were nourished with 380,000 cubic yards of material from offshore borrow area (completed in September). Also at this time, groin number 1 was constructed and 360 feet of groin number 2 was constructed.
1978	Groin number 2 was raised 2.5 feet and about 2,000 feet of shore north of groin number 1 was nourished with 50,000 cubic yards of material from Blind Pass.
1979	Restoration of 2,800 feet of beach on Long Key just south of Blind Pass with 250,000 cubic yards of material from Blind Pass.
1981	A total of 70,000 cubic yards of material from maintenance of Johns Pass was placed on Treasure Island between Stations 28+50 and 60+50.
1983	North jetty at Blind pass extended 130 feet and 4,200 feet of beach nourished with 200,000 cubic yards of material from Blind Pass.
1984	Pass-a-Grille Pass groin at Long Key was rehabilitated.

94. Treasure Island Segment. Construction of the Treasure Island segment of the project was completed in July 1969 and consisted of 120,000 cubic yards of emergency fill and 670,000 cubic yards of authorized fill. The beach fill area extended from 600 feet south of 77th Avenue (0.3 mile north of Blind Pass) to 104th Avenue, a distance of about 9,200 feet.

94. The first periodic nourishment was made in 1971 and consisted of 75,000 cubic yards of beach fill placed between 104th and 108th Streets, a distance of about 1/2 mile. The second periodic nourishment was made in 1972 and consisted of 155,000 cubic yards of beach fill placed along about 0.4 mile of shore extending south from 83rd Street to the limit of the initial beach fill near 77th Street. The third periodic nourishment was completed in September 1976 and consisted of beach fill placed along the southerly 1.5 miles of Treasure Island with 380,000 cubic yards of material. Also, at this time construction of two groins was provided; groin number 1 which is located about 2,300 feet north of Blind Pass and groin number 2 which is located at the north side of Blind Pass. In 1978, groin number 2 was raised 2.5 feet and 2,000 feet of shore north of groin number 1 was nourished with 50,000 cubic yards of material from Blind Pass. Groin number 2 was extended 130 feet earlier this year (1983) and 200,000 cubic yards of fill from Blind Pass was placed north of this groin (fourth periodic nourishment).

95. Long Key Segment. The initial project beach fill on Long Key was completed in March 1980 and consisted of placement of 143,000 cubic yards on 2,800 feet of shoreline at the north end of the island. In addition, 100,000 cubic yards of advance nourishment was placed just offshore to act as a partial breakwater at the same time act as a source of sediment to the beach. The rehabilitation of the Passe-a-Grille Pass groin was completed in 1984.

Performance of the Pinellas County Project to Date.

96. The completed segments of the project have undergone a multitude of storms. The project fill has responded to these storms largely by gradual slope adjustment and losses in the vicinity of Blind Pass.

97. Treasure Island. The initial fill in 1969 at Treasure Island has generally had good retention. However, a comparison of surveys indicate that since the third periodic nourishment in 1976 the southernmost 4,200 feet of the Treasure Island beach fill has lost about 120,000 cubic yards of material. This loss of material has reduced the scope of protection provided by the project to upland property. In addition, the groin on the north shore of Blind Pass has not been completed to its design length. This results in greater nourishment requirements for the shore adjacent to the groin. Nourishment of Treasure Island and the effects of the Blind Pass groin are summarized in the G&DDM addendums listed in Appendix A. The groin has been extended to design length as described in G&DDM Addendum III. The extension of the Blind Pass groin should stabilize the 2,000 feet of shore north of the structure as descibed in the 1975 G&DDM Addendum.

98. Long Key. The initial placement of 243,000 cubic yards of fill material was completed in March 1980. By 1984, this area had returned to

its preproject condition. The 1982 G&DDM Addendum III provides for rehabilitation of the groin at Pass-A-Grille. This groin will assure that the existing littoral regime in the area will remain the same.

Pinellas County Project Funding.

99. Table 7 summarizes project funding for Pinellas County.

TABLE 7

PROJECT FUNDING

Item	Completion Date	Federal	Non-Federal	Total
Treasure Island:				
Initial Construction	18 Jul 69	$ 262,383	$ 262,383	$ 524,766
1st Nourishment	5 Nov 71	34,822	34,739	69,561
2nd Nourishment	3 Mar 73	87,919	88,067	175,986
3rd Nourishment & groins #1 & #2	22 Sep 76	576,620	572,833	1,149,453
4th Nourishment	22 Nov 78	126,969	97,480	224,449
Total Treasure Island *		$1,088,713	$1,055,502	$2,144,215
Long Key:				
Initial Construction	Mar 80	$ 245,900	$ 245,900	$ 491,800
Total Project*		$1,334,613	$1,301,402	$2,636,015

* Does not include FY 83 project funding.

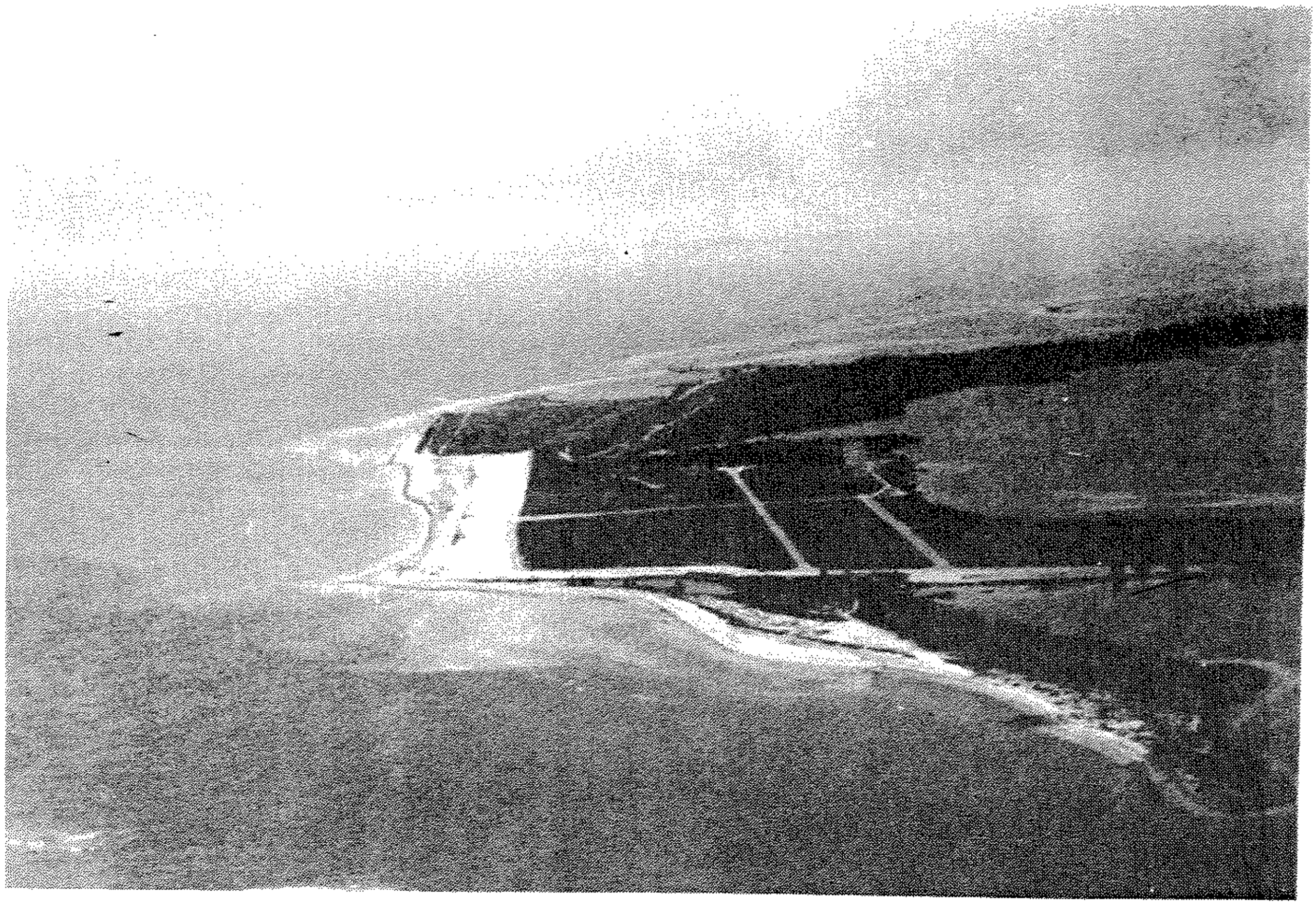
PROBLEM AREAS IDENTIFIED

100. Historic shoreline changes verified by site inspections indicate several areas of the Pinellas County shoreline have experienced erosion problems. The areas are discussed in the following paragraphs.

101. Honeymoon Island. The southernmost 4,500 feet of the island has experienced erosion over the 5-year period of record. The beach in this reach is littered with a cover of rock and as a result is of poor recreational quality due to dredge and fill operations by a developer in the late 1960's. Existing conditions are shown on figure 5.

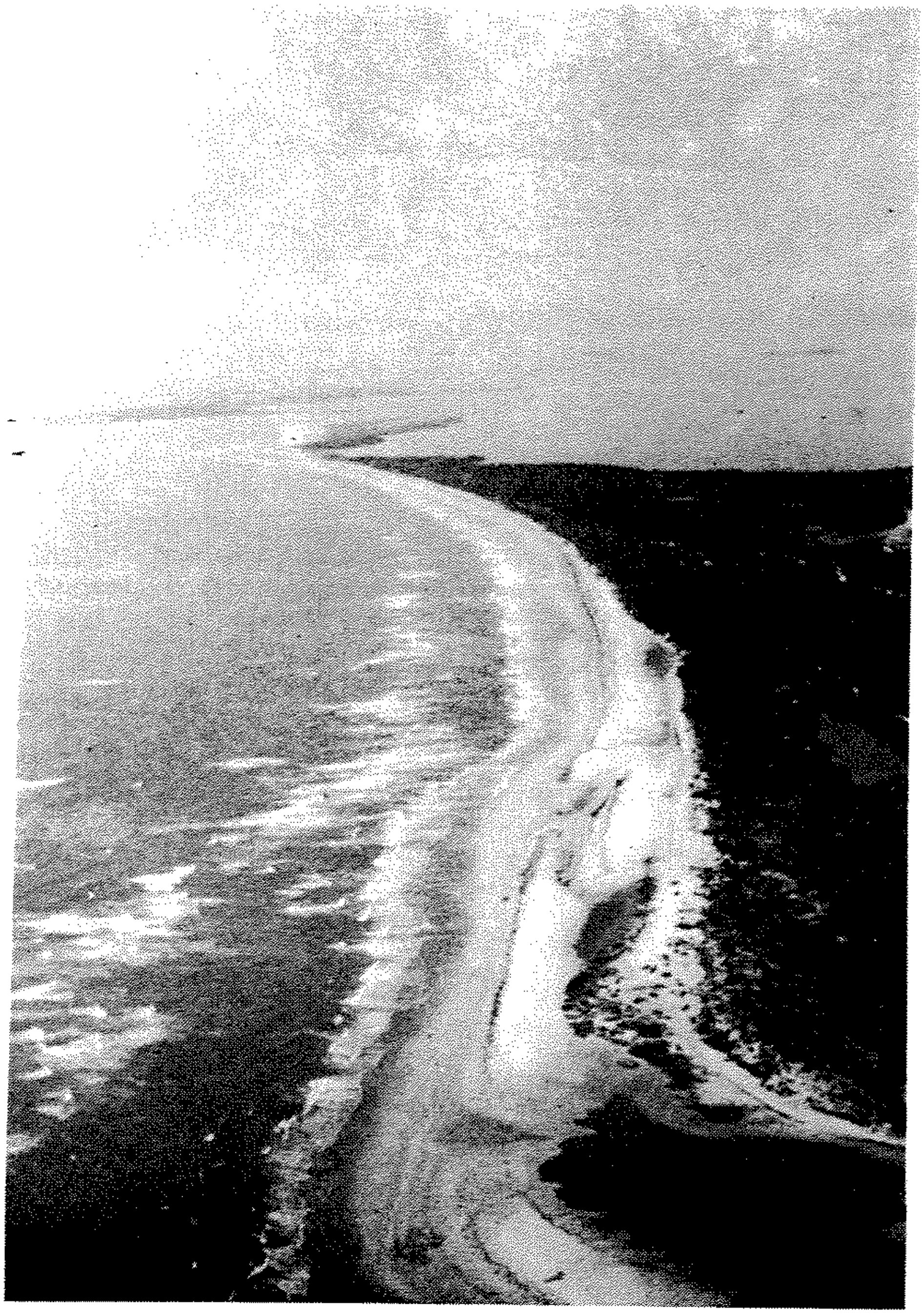
102. Caladesi Island. Significant erosion has occurred along the northern half of the island and the southernmost 2,000 feet adjacent to Dunedin Pass. Figure 6 shows existing conditions on Caladesi Island.

103. Clearwater Beach Island. There is now little or no protective and recreational beach during periods of mean high water at the northern and extreme southern ends of Clearwater Beach Island. The public beach



HONEY MOON ISLAND-LOOKING NORTH
FEBRUARY 1979

FIGURE 5



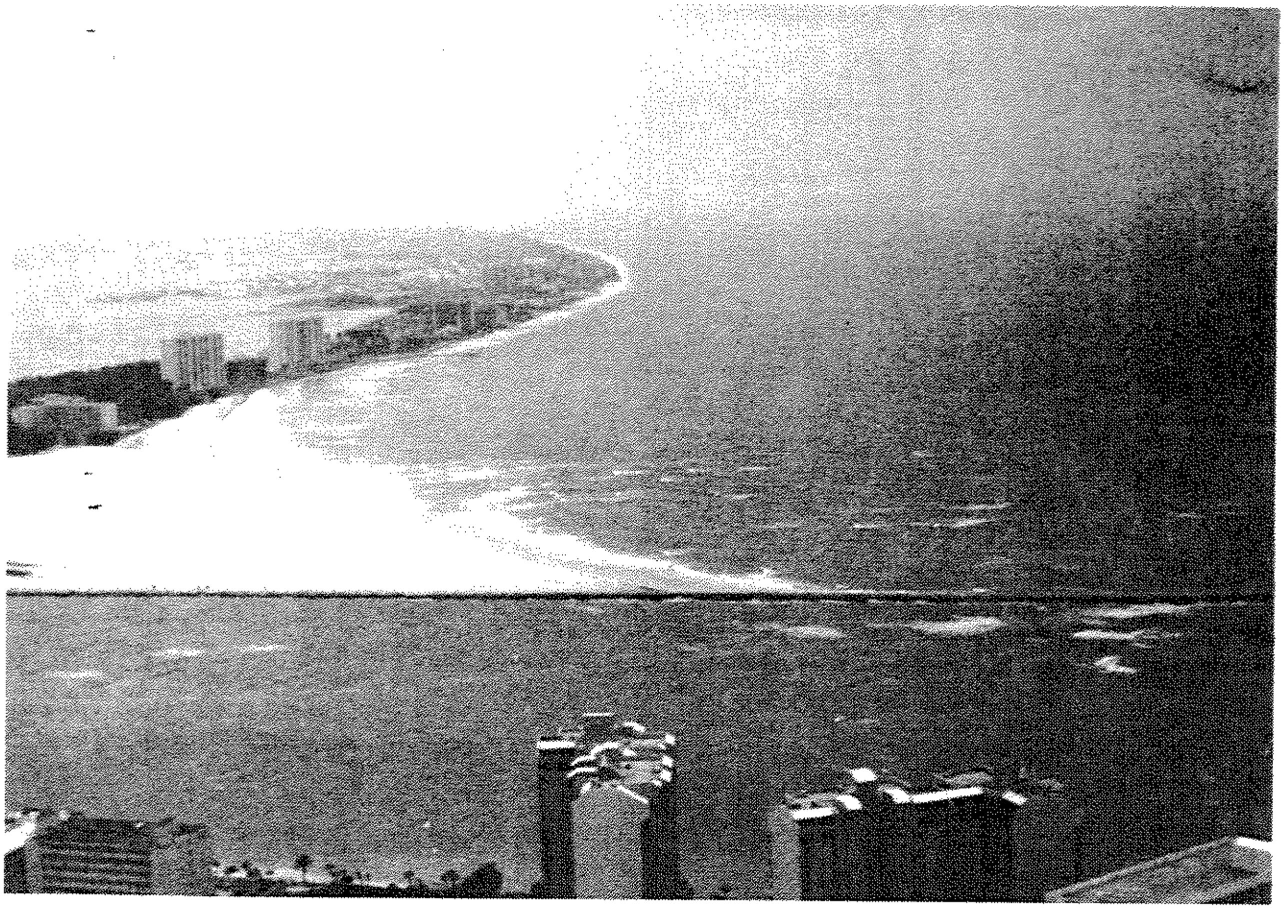
CALADESI ISLAND-LOOKING NORTH
FEBRUARY 1979

FIGURE 6

CLEARWATER BEACH ISLAND LOOKING NORTH FEBRUARY 1979

CLEARWATER MUNICIPAL BEACH FEBRUARY 1979

FIGURE 7



CLEARWATER PASS - NORTH END OF SAND KEY FEBRUARY 1979

CLEARWATER BEACH - SAND KEY FEBRUARY 1979

FIGURE 8

extending south from the center of the island has an average width of 100 feet. These conditions are depicted in figure 7. The condition of the beach at the northern end of the island is shown on figure 8.

104. Sand Key. On Sand Key, there is little or no protective or recreational beach the entire length of the island, except at the extreme ends of the island. Almost the entire length of the island is fronted by seawalls or bulkheads. Figures 9, 10, and 11 depict conditions at the northern end of Sand Key. The southernmost groin, at Johns Pass, was constructed by the city of Maderia Beach in 1961. Inspection of the groin was performed in August 1980. A major rehabilitation of the structure is necessary. Unless the groin is repaired, loss of the protective and recreational beach impounded north of the groin will occur. The groin and adjacent beach are shown in figure 12.

105. Treasure Island. As discussed previously, the Federal beach erosion control project has been implemented at Treasure Island. This has resulted in a minimum beach width of 100 feet on Treasure Island except for the southern 4,200 feet. The north groin at Blind Pass has been extended which should reduce losses is this area. The south end of Treasure Island is shown on figure 13.

106. Long Key. The Federal beach erosion control project has been implemented for Long Key. The sand bar constructed offshore of Long Key acted as a breakwater and feeder beach to the north end of the island for from 1 to 2 years. Hydrographic surveys in 1983 confirm that the bar has moved out of the area. Figures 14, 15, and 16 show Treasure Island and Long Key in March 1980 after completion of the Long Key segment. The groin and impoundment beach are shown in figure 17. This work has been completed. Rehabilitative work was initiated in May 1984 at the Pass-A-Grille groin in conjunction with the 1982 G&DDM Addendum III for Pinellas County.

107. Mullet Key. As discussed previously, a Federal beach erosion control project has been implemented at Mullet Key. This has resulted in minimum beach berm of 60 feet along the gulf leg of Mullet Key. There were no identified problem areas; however, spoil material from the Tampa Harbor dredging project placed on both the gulf and south shores of Mullet Key in 1977 has offset expected erosion.

IMPROVEMENTS DESIRED

108. Local interests desire that a survey be made of the gulf shores of Pinellas county as may be necessary in the interest of beach erosion control, hurricane protection, and related purposes. They also desire a determination of the required remedial measures of the degree of maximum Federal aid. A high degree of interest and support for permanent remedial measures for beach erosion problems of the county was presented by the local interests at the initial public meeting.

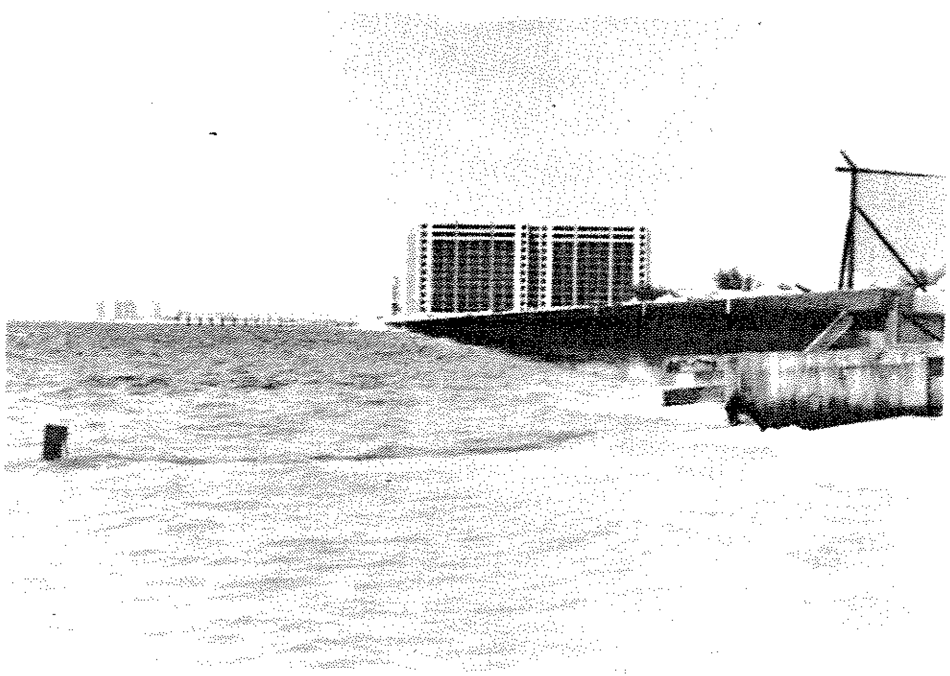
INDIAN ROCKS BEACH, SAND KEY, LOOKING NORTH, MARCH 1983

FIGURE 9

MADEIRA BEACH AND REDINGTON BEACH, SAND KEY, MARCH 1983

FIGURE 10

HARBOR LIGHT TOWERS, CLEARWATER BEACH, SAND KEY, AUGUST 1980

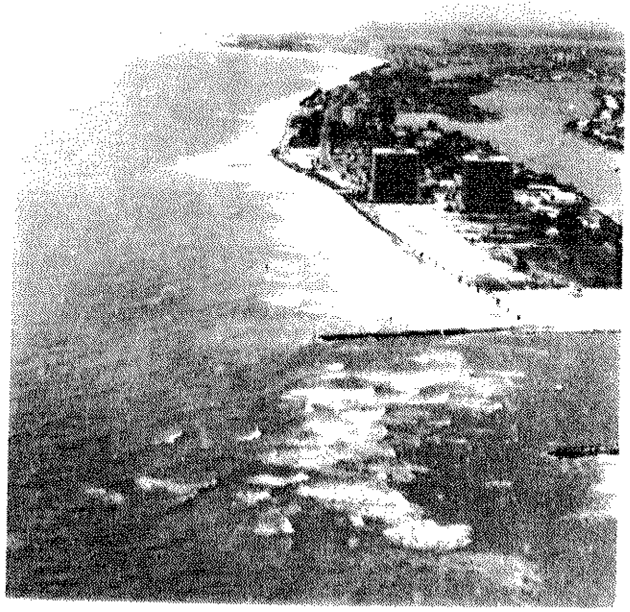


BELLEVIEW, BILTMORE CABANA CLUB, SAND KEY, LOOKING NORTH, AUGUST 1980

FIGURE 11

SOUTH END OF SAND KEY & JOHNS PASS
FEBRUARY 1979

FIGURE 12



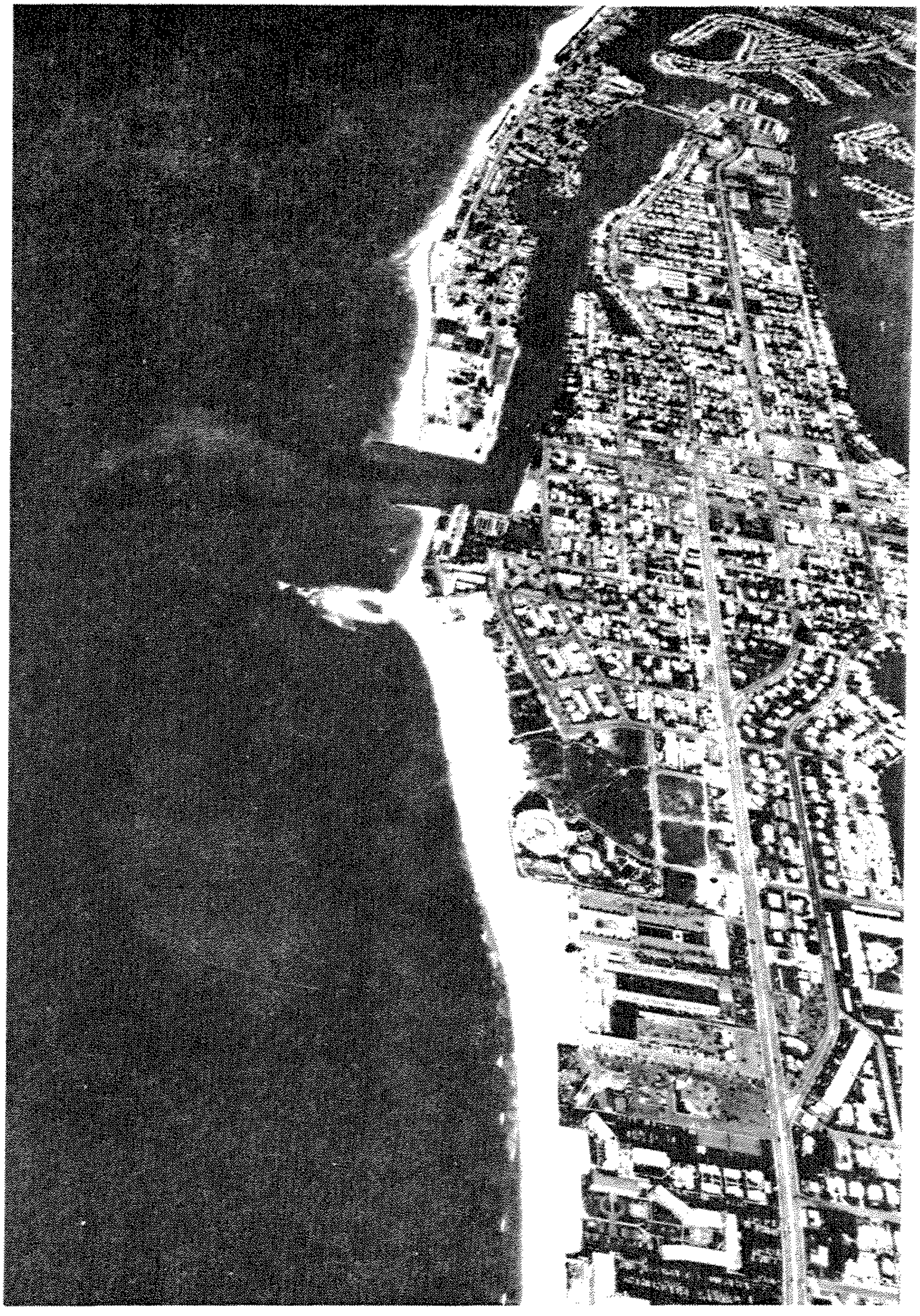
SOUTH END TREASURE ISLAND, LOOKING NORTH
FEBRUARY 1979

NORTH END OF LONG KEY LOOKING SOUTH
FEBRUARY 1979

FIGURE 13

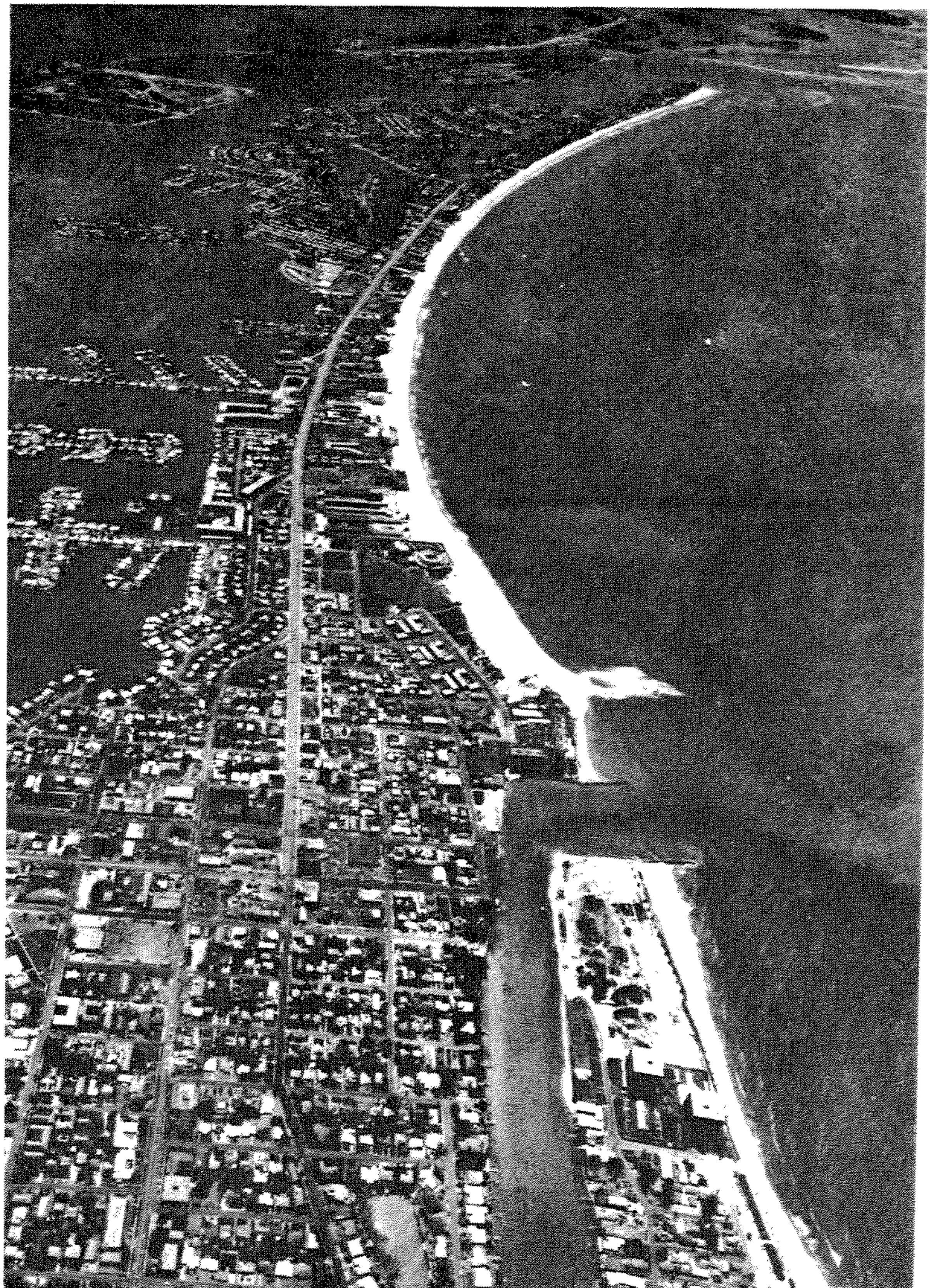
TREASURE ISLAND AND JOHNS PASS
MARCH 1980

FIGURE 14



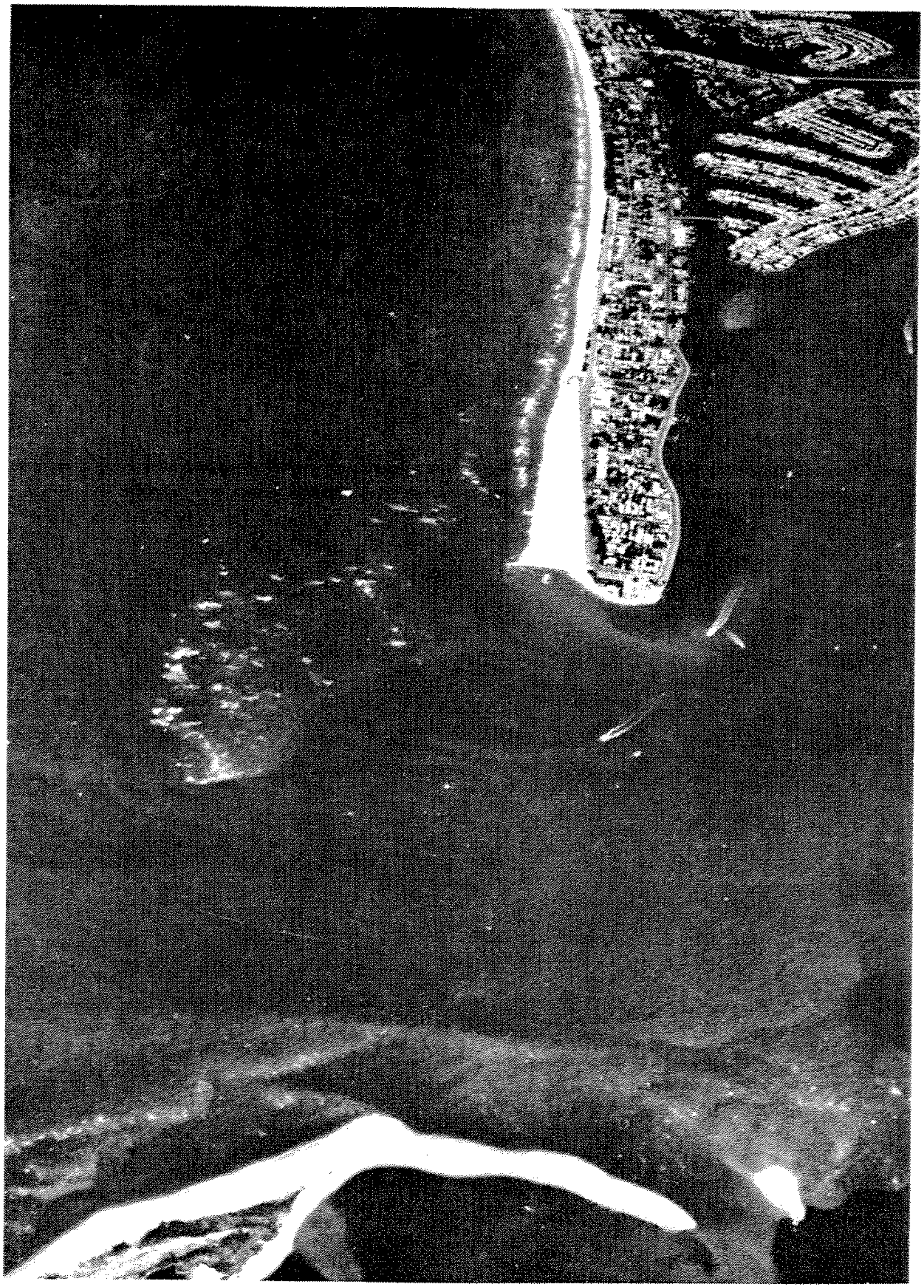
NORTH END OF LONG KEY KEY, BLIND PASS, AND SOUTH END OF TREASURE ISLAND MARCH 1980

FIGURE 15



SOUTH END OF TREASURE ISLAND, BLIND PASS, AND LONG KEY
MARCH 1980

FIGURE 16



SOUTH END OF LONG KEY AND PASS-A-GRILLE PASS
MARCH 1980

FIGURE 17

PLAN FORMULATION

GENERAL

109. With respect to the local planning objectives and the Water Resources Council's Principles and Guidelines objectives, a preliminary formulation and evaluation process was conducted using all appropriate measures identified, without bias, including those proposed or suggested by different groups and agencies to determine which warrant further detailed analysis. Both structural and nonstructural means were given equal consideration during this analysis.

EVALUATION CRITERIA

110. The "Principles and Guidelines" require the systematic preparation and evaluation of alternative ways of addressing identified problems, needs and concerns, and opportunities under the objective of National Economic Development (NED) consistent with protecting the nation's environment. The process also requires that the impacts of a proposed action be measured and the results displayed or accounted for in terms of contributions to the four accounts of: NED, EQ, Regional Economic Development (RED), and Other Social Effects (OSE). The following economic, socioeconomic, and environmental criteria was adopted during the formulation process:

- Tangible benefits should exceed project economic costs;

- Each separable unit of improvement or purpose should provide benefits at least equal to its cost;

- Within the framework of the formulation criteria the scope of the development should provide the maximum net benefits;

- The costs for alternative plans of development should be based on preliminary layouts, estimates of quantities, and January 1984 unit prices;

- The benefits and costs should be in comparable quantitative economic terms to the fullest extent possible;

- Annual costs and benefits should be based on a 50-year amortization (project economic life) period and an interest rate of 8 1/8 percent;

- The annual charges should include the cost of operation and maintenance of the considered plans.

- Plans should avoid all detrimental environmental effects to the extent feasible; and,

- Unavoidable adverse environmental impacts should be fully noted, quantified when possible and qualified in any case to facilitate a knowledgeable decision making process.

Environmentally, plans should also:

- preserve unique and important ecological, esthetic, and cultural values of our national heritage.

- conserve and use wisely the natural resources of our nation for the benefit of present and future generations.

- restore, maintain, and enhance, the natural and manmade environment in terms of its productivity, variety, spaciousness, beauty, and other measures of quality.

- create new opportunities for the American people to use and enjoy their environment.

Socioeconomically, plans should minimize and, if possible, avoid:

- Destruction or disruption of community cohesion;

- Injurious displacement of people, and,

- Disruption of desirable community growth;

Considerations should be given to protection of historical, archeological, and other public interest areas;

- Plans should not significantly increase noise pollution during construction or create conditions that will tend to raise the overall noise level of the area over the project life; and,

- Provisions should be made during project formulation to afford interested locals an opportunity to participate in the selection of a plan.

Flood Plain Management Criteria

111. Executive Order 11988, Flood Plain Management, signed 24 May 1977, requires Federal agencies to recognize significant values of flood plains and to consider the public benefits that would be realized from restoring and preserving flood plains. In development of alternative solutions to the erosion problem in Pinellas County, consideration is given to the following:

- Avoid development in the base flood plain (100-year flood) unless it is the only practicable alternative;

- Reduce the hazard and risk associated with floods;

- Minimize the impact of floods on human safety, health, and welfare; and

- Restore and preserve the natural and beneficial values of the base flood plain.

FORMULATION METHODOLOGY

112. The final plans selected for detailed analysis reporting were developed through a three-step planning process. These steps were: (1) Identification of possible solutions; (2) Development of alternatives, and (3) Assessment of alternatives. Each step was iterative in the process of identifying and selecting the best possible courses of action for the study area.

113. During the first step, the population of alternatives developed included traditional type projects, programs that could be carried out by local interests and all suggestions surfaced by participants in the initial public meeting. Each plan in the array was screened based on its ability to satisfy the planning objectives. The viable plans were developed sufficiently to assess generalized benefits, costs, and impacts. Those plans meriting closer evaluation were carried into the second step.

114. In the second step, the problems of the project site were reevaluated and the local planning objectives specified. The alternative plans carried over from step one were then refined to an increased level of design with emphasis on the overall capability and reliability of each plan to meet the specific planning objectives. These intermediate plans were screened according to the established criteria and those meriting more detailed study were carried into the third step.

115. In the third step, detailed analyses were conducted on those plans carried over from Step 2. Based on the result of these analyses, a plan was developed for implementation.

ANALYSIS OF PLANS CONSIDERED IN PRELIMINARY PLANNING.

116. The possible solutions considered in the first step of project formulation are listed in table 8. Many of the alternatives were not retained for detailed analysis because they did not address fully the planning objectives. Planning objectives considered in the preparation of this table include the local objectives and the accouts required by the Water Resources Council's "Principles and Guidelines." These alternatives are discussed in the following paragraphs.

a. Nonstructural (NS).

NS-1 No action. The "no action" alternative perceives the continuation of existing conditions and provides no solution to existing problems. However, it also avoids any undesirable effects that may be associated with structural or nonstructural plans of improvement. This option, although not favored by local study sponsors, is considered in relation to the effects of other alternatives.

NS-2 Rezoning of beach area. Rezoning of the beach area and modification of building codes would result from the implementation of a construction setback line. This is a viable measure for reducing storm damages and is carried forth as part of the nonstructural combination plan of the intermediate alternatives.

TABLE 8
POSSIBLE SOLUTIONS AND PLANNING ACCOMPLISHMENTS

Possible Measures		Local Planning Objectives[1]					Principles and Guidelines Accounts[2]			
		RB	FP	EC	TBE	CZM	NED	EQ	OSE	RED
	NONSTRUCTURAL MEASURES (NS)									
NS-1	NO ACTION	0[3]	0	0	0	0	0	0	0	0
NS-2	Rezoning of beach area	0	P	0	P	P	P	0	P	P
NS-3	Modification of building codes	0	P	0	0	0	P	0	P	0
NS-4	Construction setback line	0	P	P	P	P	P	0	P	P
NS-5	Moratorium on construction	0	P	0	0	0	0	0	0	0
NS-6	Flood insurance	0	0	0	P	0	0	0	P	0
NS-7	Evacuation planning	0	0	0	0	0	P	0	P	0
NS-8	Establish a no-growth program	0	0	0	0	0	0	P	0	0
NS-9	Condemnation of land and structures	P	P	P	0	P	0	F	P	0
NS-10	Various combinations of above	-	-	-	-	-	-	-	-	-
	STRUCTURAL MEASURES (S)									
S-1	Beach revetment	0	P	P	0	0	0	0	P	0
S-2	Beach fill with periodic nourishment	P	P	P	P	P	P	P	P	P
S-3	Beach fill with periodic nourishment stabilized by offshore breakwaters	P	P	P	P	P	P	P	P	P
S-4	Beach nourishment with maintenance material from adjacent inlets	P	P	P	P	P	P	P	P	P
S-5	Beach fill with periodic nourishment stabilized by groins	P	P	P	P	P	P	P	P	P
S-6	Seawalls	0	P	P	0	0	P	0	P	0
S-7	Beach fill with periodic nourishment and hurricane surge protection - sand dune	P	P	F	P	P	P	P	P	P
S-8	Beach fill with periodic nourishment and hurricane surge protection project stabilized by offshore breakwaters	P	P	F	P	P	P	P	P	P
S-9	Stabilization of beaches and dunes by vegetation	0	P	P	P	P	0	P	P	P
S-10	Relocation of structures	0	F	P	0	0	0	P	0	0
S-11	Flood proofing of structures	0	F	0	0	0	0	0	P	0
S-12	Various combinations of above	-	-	-	-	-	-	-	-	-

NOTES:

[1] RB - Provisions of recreation beach
FP - Proteciton of flooding and wave damage
EC - Beach erosion control
TBE - Protection of tourist base economy
CZM - Coastal Zone Management & Conservation

[2] NED - National Economic Development
EQ - Environmental Quality
OSE - Other Social Effects
RED - Regional Economic Development

[3] F - Meet fully objective
P - Meet partially objective
0 - Not meeting objective

NS-3 Modification of building codes. "Hurricane proofing," where sufficient time exists before hurricane landfall, can reduce wind and rain damage but has no effect on tidal-flood reduction. Revised zoning regulations, more realistic bulkhead lines and minimum fill elevations would also have little effect on tidal flooding because of the advanced state of development of the Pinellas County barrier islands. However, in areas where modified building codes could help prevent damages, it should be considered. Therefore, this alternative is carried forward as part of the non-structural combination plan.

NS-4 Construction setback line. A construction setback line would not affect existing development and could only be effective in the unforseeable future as buildings are razed and destroyed by storms and replaced, and as buildings are constructed on the remaining undeveloped land. However, this alternative is acknowledged and included in the nonstructural combination plan, and plans are developed around it.

NS-5 Moratorium on construction. Moratorium on construction is rejected by local interest since the desired growth of the area is oriented towards tourism and recreation, attracting retirees and promoting a stable construction industry.

NS-6 Flood insurance. Flood insurance, per se, does not prevent damage; it merely lessens the monetary loss of the individual property owner. This alternative could limit unwise development of the coastal area and is carried forward as part of the non-structural combination plan.

NS-7 Evacuation planning. This is a nonstructural alternative which will be incorporated in the nonstructural combination plan.

NS-8 Establish a no-growth program. The establishment of a no-growth program is rejected by local interests. Growth in the area, particularly that in connection with beach activities, is needed to provide economic depth to the communities. This alternative is, therefore, excluded from detailed studies.

NS-9 Condemnation of land and structures. This alternative would allow the shoreline to erode in the area with a loss of land until shoreline equilibrium was established. This alternative does not provide any protection from erosion or wave damage and is rejected by the local sponsor.

NS-10 Various nonstructural combinations. It is recognized that various aspects of many of the preceeding nonstructural solutions would be prudent to implement either collectively or in combination with structural alternatives. For the study shoreline, a single nonstructural plan does not seem applicable for the entire area.

b. Structural (S).

S-1 Revetment. Revetments have been placed on similar beaches over the past to protect critically damaged or eroding areas. These measures have provided temporary relief, but have not reduced the erosion of the beaches. The hardening of the beach in one area will merely transfer the location of the problems further down the beach.

S-2 Beach fill with periodic nourishment. This alternative would provide a beach with project dimension size for recreational purposes as well as a buffer against wave attack. An offshore source of sand is considered as inland sources are unavailable due to environmental factors. Renourishment of the beach would be undertaken periodically to maintain the recreational and erosion control features within design dimensions.

S-3 Beach fill with periodic nourishment stabilized by an offshore breakwater. The construction of breakwaters offshore along the problem area is considered as an alternative to reduce periodic nourishment quantities needed to maintain a protective and recreational beach fill in this area. Such structures would reduce the amount of wave energy reaching the shoreline in their lee. The formation of a partial tombolo would occur if the breakwaters are of sufficient size, thus, decreasing the rate of annual erosion and thereby decreasing the annual nourishment requirements.

S-4 Beach fill with maintenance material from adjacent inlet. This alternative is similar to the previous beach fill alternative, but takes advantage of the material which is obtained from the maintenance dredging from adjacent inlets. Maintenance operations or new work has not occurred on a regularly scheduled basis, however, and all of the dredged material from the inlet might not be suitable and sufficient to satisfy the nourishment requirements, therefore, this alternative should be considered as a supplement to the offshore borrow area and will be included as part of the structural combination plan.

S-5 Beach fill and periodic nourishment stabilized by groins. Groins or a groin field in the problem area would help hold a beach in front of existing development and prevent further losses of land. The construction of groins would have to be supplemented with nourishment so that adjacent beaches would not be starved of sand. For this reason, groins are considered as a method to help hold the fill in place and to reduce the periodic renourishment requirements.

S-6 Seawalls. The construction of additional concrete seawalls or improvements to and maintenance of the existing bulkheads/seawall would provide a significant degree of protection; however, this would be accomplished at the expense of a recreational beach, resulting in substantial economic loss to the area. Reflecting wave energy off the existing seawalls and bulkheads has resulted in a steepening of the offshore profiles with resulting hazardous bathing conditions due to increased undertow and runouts. High initial costs in addition to these reasons eliminate this alternatives from further consideration.

S-7 Beach fill with periodic nourishment and hurricane surge protection sand dune. This alternative would help protect the Pinellas County shoreline from storm damages. Measures to prevent damages from hurricane-induced surges and wave runup would be provided for a relatively high degree of protection for the oceanfront structures located along this reach of shoreline.

To provide a complete system of protection against tidal flood damages is engineeringly possible. However, such protection is not economically justifiable.

S-8 Beachfill with periodic nourishment and hurricane surge protection - offshore breakwaters. This alternative would essentially provide the same benefits attributed to alternative S-7 above, but the construction of offshore breakwaters would materially reduce the periodic nourishment quantities required to maintain project dimension size during the economic life of the project. This alternative is not economically feasible due to high cost of breakwaters for hurricane surge protection purposes.

S-9 Stabilization of beaches and dunes by vegetation. This alternative would provide beach grass and sand fences to the berm. The primary benefits from the provision of sand fences and beach grasses are derived from the quantity of sand saved and the ability of the works to provide stability to the berm. This alternative would result in a reduction of the quantity of periodic nourishment required. The addition of beach grass and sand fences would remove an unspecified amount of dry beach away from recreational beach use. A variation of this alternative could be implemented at a later date in combination with beach fill if the formulation of wind blown sand dunes and landward migration thereof become a problem.

S-10 Relocation of structures. The relocation of the structures would allow the area to continue to erode and the land in this area would be lost until an equilibrium shoreline is reached. However, most structures within the area cannot be economically moved from the area which would be lost. In addition, implementation of this alternative would result in the loss of valuable recreational beach and would necessitate the condemnation of the land and structures in the areas where implemented.

S-11 Flood proofing of structures. Flood proofing of existing structures and regulation of flood plain and shorefront development are considered part of building code modifications.

S-12 Various Structural Combinations. Select features of the preceeding structural solutions could be implemented collectively or in combination with the nonstructural alternatives. This alternative will therefore be carried forward in the formulation process.

S-13 Continued Nourishment of Existing Project. This alternative is duplicative since the economic feasibility of periodic nourishment is determined in alternative S-2. This alternative is therefore not carried forward.

ANALYSIS OF INTERMEDIATE ALTERNATIVES

117. The previous paragraphs describing the possible solutions eliminated and combined many of those considered. The nonstructural and structural alternatives were further combined to make up combination plans which will be developed in the detailed analysis. The no action alternative is carried

throughout the plan formulation for consideration and comparison. The intermediate alternatives, thus considered, are listed below:

NS-1 No action

NS-10 Nonstructural combination plan (developed in detailed analysis)

S-2 Beach fill with periodic nourishment - offshore borrow areas

S-3 Beach fill and periodic nourishment in combination with offshore Breakwaters

S-5 Beach fill with periodic nourishment stabilized by groins

S-12 Structural combination plan

Development and Preliminary Analysis of Intermediate Plans.

118. Preliminary plans, designs, and cost estimates were formulated for the structural alternatives. A combination of nonstructural plans were developed during Step 3 of the study. The structural alternatives considered for further analysis are discussed in the following paragraphs.

119. Design criteria. The alternatives selected for beach erosion control should serve two purposes. Protection should be provided against normal weather and to a partial degree against storms; and ample beach area should be preserved or provided for present and future recreational needs. The minimum width of design berm selected for the protective beach is 20 feet based on constructability constraints. The final berm width selected for this alternative was based on optimization of the beach width as discussed in appendix D. The design elevation is 6 feet above mean low water. Studies indicate that storm tides (exclusive of wave runup) would exceed elevation 6 feet, m.l.w., once in about 10 years. Tides from a severe hurricane could exceed this level considerably. The most severe tide that could be expected is about 13-14 feet above mean low water; however, a tide of this magnitude has a frequency well in excess of 100 years. A protective beach of the dimensions chosen would permit seasonal changes and normal losses for about 5 years without significant reduction of protection. The design beach would also offer needed protection to structures and upland development during storms. Changes in the beach profile, due to major past storms, indicate that the design characteristics would provide an adequate protective beach. The existing beach erosion control project for Treasure Island has provided adequate protection. The estimated slopes of 1 on 20 from the berm to mean low water and 1 on 30 from mean low water to intersection with existing bottom are based on the existing average slopes of those two zones, and are used for estimating quantities. Actual slopes will be as shaped by wave action. The design characteristics of the breakwaters and groins were those required to serve the intended purposes both functionally and economically.

120. The design beach in itself would be inadequate to prevent flooding due to overtopping during a severe hurricane. The sloping beach would substantially reduce overtopping on the gulfside from all but severe hurricanes on critical paths. Complete protection against tidal flooding from the gulfside is not feasible due to the low natural elevations of the islands and to the exposed baysides of the island.

121. Alternative S-2, beach fill with periodic nourishment. This plan consists of providing beach fill with periodic nourishment with the cross-sectional configuration as discussed above. Analysis of data indicates that some of the Pinellas County beaches are either stable or accreting or have been adequately improved by local interests and therefore do not at this time require improvement. Analysis also indicates that three physically separate islands require initial restoration and periodic nourishment, one reach requires advance nourishment, and all seven islands require periodic nourishment. The areas under consideration for improvement are discussed separately in paragraphs below.

122. For estimating purposes, an average interval of 5 years is used for nourishment of the improved beaches. It is considered desirable to place 2-5 years advance supply of nourishment in connection with the initial beach restoration to avoid the possibility of excessive narrowing of the beach prior to beginning of subsequent nourishment operations. Periodic nourishment of the improved beach, which would be provided when needed, would restore the beach to desired dimensions. Periodic nourishment for any other areas where erosion might develop would also be provided when needed.

123. The plan for Honeymoon Island under alternative S-2 would provide initial restoration for about 0.9 mile of shore. The dimensions and characteristics of the restored beach would be as discussed in paragraph 119. The estimated volume of material required for initial restoration with a 20-foot berm width is 80,000 cubic yards. Periodic nourishment would be provided for the entire shoreline as needed. The average annual nourishment requirement for the restored beach is 15,000 cubic yards.

124. The plan for Caladesi Island would provide for periodic nourishment of the entire island in conjunction with nourishment of Honeymoon Island due to the proximity of the borrow area. The average annual nourishment requirement is 10,000 cubic yards.

125. The plan for Clearwater Beach Island would provide for initial restoration of 5,000 feet of shoreline with a 40-foot berm with 100,000 cubic yards. Periodic nourishment of the entire island would be provided as needed. The average annual nourishment requirement is 10,000 cubic yards.

126. Initial restoration is required for 7.3 miles of Sand Key, for that reach extending from the north city limits of Indian Rocks Beach south to a point 15,000 feet north of Johns Pass. The estimated volume of material required for initial restoration with a 40-foot berm is 2,670,000 cubic yards. Periodic nourishment of the entire island would be provided as needed, and is estimated at 56,000 cubic yards annually. The nourishment rate for Sand Key was adjusted to reflect the assumed rehabilitation of the groin on the northside of Johns Pass as part of the without project condition.

127. For Treasure Island, periodic nourishment of the entire island would be provided as needed. The average annual nourishment requirement is 50,000 cubic yards. Authorized project dimensions would be maintained.

128. Advance nourishment of the northern 1,500 feet of Long Key is required. The estimated volume of material is 150,000 cubic yards. Periodic nourishment of the entire island would be provided as needed. The average annual nourishment requirement is 50,000 cubic yards. Authorized project dimensions would be maintained.

129. The plan for Mullet Key would provide for periodic nourishment of the project shore as needed. Average annual nourishment requirements are estimated at 30,000 cubic yards. Authorized project dimensions would be maintained.

130. It is considered that the measures required for each of the island segments can be constructed independently of each other as separate useable parts.

131. <u>Alternative S-3, beach fill with periodic nourishment stabilized by offshore breakwaters</u>. This plan provides for a protective and recreational beach fill, alternative S-2, in conjunction with the construction of offshore submerged breakwaters to help stabilize and hold the fill in place and, therefore, reduce periodic nourishment requirements.

132. Offshore breakwaters for the barrier islands of Pinellas County are not economically justified, with the exception of Sand and Long Keys. A sand breakwater, 600 by 600 feet, at a top elevation of mean low water, was justified in the 1978 G&DDM Addendum for Long Key. Continued nourishment of the sand breakwater at Long Key is reflected in the nourishment rates for alternative S-2 at Long Key. Therefore the sand breakwater is assumed as part of the without project condition for Long Key and is not considered further.

133. Preliminary evaluations indicate that the addition of offshore breakwaters along the shorefront of Sand Key experiencing the highest erosion rates could also reduce periodic nourishment requirements sufficiently to cause the addition of breakwaters to the beach fill and periodic nourishment plan to be economically justified. However, due to the high costs and uncertainties on constructing numerous breakwaters along Sand Key, further detailed studies on wave climate and breakwater effectiveness, which are outside the scope of this study, were necessary. Therefore this alternative for Sand Key is not examined further.

134. <u>Alternative S-5, beach fill with periodic nourishment stablized by groins</u>. A groin field to stablize the previously discussed beach fills for each island segment were considered. This field would not completely eliminate periodic nourishment (60% reduction assumed) but would detract from the esthetics of the area and would decrease the safety of bathers. In addition, it is more economical to periodically nourish the beaches than it is

to construct and maintain a groin field. However, for that area of shoreline adjacent to and north of each inlet, the construction of a groin field or the extension of each inlet's north jetty would substantially reduce the side end losses of subsequent fills northward and, therefore, assist in the reduction of material entering the inlet during flood tides or jetted offshore during ebb tide when southerly drift is occurring. The elimination or reduction of these material losses into the inlet would provide a stabilizing factor to those beaches to the north. This alternative has been implemented at Long Key, Treasure Island, and Sand Key. However, it was not economically justifiable at Honeymoon, Caladesi, and Clearwater Beach Islands. The groin on the north side of Johns Pass, because of its existing condition, is in need of rehabilitation. This rehabilitation is being considered under the existing project authority for construction. The purposes of this report, the groin at Johns Pass is considered to be rehabilitated as part of the without project condition. Nourishment rates for Sand Key in alternative S-2 have been adjusted to reflect this assumed without project condition. Alternative S-5 will therefore not be carried into stage 3 planning.

135. Alternative S-12, various structural combinations. The features of alternative S-5 are considered to be in place as part of the without project condition. Implementation of alternative S-3 was deferred pending the outcome of future studies. The only remaining structural plan is S-2. Therefore to carry this plan (S-12) forward would be duplicative, and is therefore not considered further.

DEVELOPMENT OF DETAILED PLANS AND COMPARATIVE ANALYSIS

136. Evaluation of the intermediate alternatives determined that two nonstructural and one structural plan warranted further investigation. Due to the nature of Pinellas County beaches, it has been more efficient to consider each island separately. As previously discussed, the "no-action" alternative is carried forward for comparative purposes. The following nonstructural and structural plans were carried forward for detailed analysis.

- No-action (NS-1)
- Nonstructural combination plan (NS-10)
- Beach fill with periodic nourishment from offshore sources (S-2)

EFFECT ASSESSMENT

137. As previously stated, the No-Action alternative is carried throughout the plan formulation as a basis of comparing the effects of other alternatives. An effect assessment of the plan considered for protection of the shores of Pinellas County was carried out in terms of the plan's contributions to the four accounts of NED, EQ, RED, and OSE. Also, a system of accounts displaying the results of this assessment was prepared and is shown in table B-1 of appendix B. A summary of the effects of the considered plans is presented in table 14, which follows the last page of this section of this report. Since the alternative of extending the period of Federal participation in the cost of providing periodic nourishment does not change existing or future conditions, this alternative was not included in the effect assessment.

NO-ACTION PLAN (NS-1)

Plan Description

138. The no-action plan alternative allows the continuation of existing conditions and provides no solution to existing problems.

Impact Assessment

139. This option avoids any undesirable effects that may be associated with structural or nonstructural plans of improvement. However, if steps are not taken to counteract the erosion, further erosion and recession of the shoreline will occur with subsequent loss of valuable property and undermining of structures along the shore. Loss of the beach would reduce the attractiveness of the area to tourists and local residents, thus exerting a negative effect on the local economy.

Evaluation and Trade-Off Analysis

140. This option, although not favored by local project sponsors, is considered in relation to the effects of other alternatives.

Implementation Responsibilities.

141. There would be no Federal responsibility in the implementation of this alternative.

Public Views

142. The public view of this and the other alternatives is contained in appendix E.

NONSTRUCTURAL COMBINATION PLAN (NS-10)

Plan Description

143. The nonstructural combination plan alternative consists of rezoning of the beach area, modification of building codes, establishing a construction setback line, participation in the Federal Flood Insurance Program, and evacuation planning.

Impact Assessment

144. Zoning and building codes. There are regulatory controls which can be, and in many instances should be, exercised by the city administration and county commissioners and planners in the interest of reducing damage in times of severe storms. These controls include zoning ordinances and building codes. They should be utilized to permit wise development in order to prevent excessive property damage, public expense, inconvenience, and, most of all, possible loss of life.

145. Greater stress must be placed upon local protective measures resulting from flood plain regulations. Such measures might include sand dune preservation, penalties for lowering or breaching dunes or for removing stabilizing vegetation, penalties for removing sand, stronger zoning and building codes to require greater setback of dwellings and buildings from the surge line, and the placement of structures on piling where such structures are exposed to wave action which would undermine normal foundations.

146. Construction setback line. The State, in recognizing the support needed by local communities and coastal counties for technical and legislative assistance, has provided for a coastal construction setback line throughout the State. Comprehensive engineering studies and topographic surveys are currently being conducted by the State in order to establish the construction setback line in Pinellas County.

147. Evacuation planning. The U.S. Weather Bureau now forecasts tidal stages during tropical storms and hurricanes. It maintains continuous service and is constantly improving its warning capabilities. This service, combined with emergency mobilization, aids in preventing loss of life and property. However, considerable time is required for emergency precautionary measures to be taken such as sandbagging doors and windows and removing goods and equipment to higher levels. A warning system, no matter how extensive or elaborate, may not provide sufficient time to take the adequate precautions to reduce storm losses. Hurricane alerts and near misses result in "scares" and cause hardship and economic loss. Storm warnings are necessary but are only a part of any plan of protection. Emergency evacuation planning of the low-lying and coastal areas of Pinellas County is handled by the County Civil Defense Office which provides plans, shelters (Red Cross), and transportaton, etc., to residents of these areas during times of hurricanes and other natural disasters. Evacuation routes from these areas are determined by the civil defense for each occurrence based on the storm track approach.

148. Flood Insurance Program. A summary of the flood potential in the Pinellas County coastal areas is provided in the Flood Plain Insurance Study Report by the National Ocean and Atmospheric Administration (NOAA) referenced in the 1974 GDM. The county is in the Federal Flood Insurance Program and is currently complying with Federal Insurance Administration requirements. Similar controls have been adopted by many communities and are being accepted as a practical approach to the safer development of.flood plains. The adoption and enforcement of adequate flood plain regulations need not prevent the use of areas but will insure against unwise development in flood plains, thus reducing both future hazards and damages. Measures which are essential to a comprehensive approach to flood damage prevention are: flood warning, flood proofing, flood plain clearance, and flood plain marking, land acquisition for open space needs, and development policies restricting extension of utilitites and streets.

Evaluation and Trade-Off Analysis

149. To provide a complete system of protection against tidal flood damages is engineeringly possible. However, such protection is not economically justifiable, is not socially amenable, and is institutionally objectionable.

Local interests have adopted many of the nonstructural items; i.e., evacuation plans, and flood insurance, and are considering others; i.e., construction control line. The implementation of this alternative would contribute to the EQ plan.

Implementation Responsibilities

150. The adoption of effective regulatory measures to prohibit development of homes, subdivisions, and commercial centers in hazardous flood areas is a local responsibility. It will result in the saving of lives and property in the area while diminishing future demands on the Federal, State, and local governments for flood relief and flood control expenditures.

Public Views

151. Public views concerning this and other alternatives are contained in appendix E.

BEACH FILL WITH PERIODIC NOURISHMENT (S-2)

Maximizing Net Benefits

152. Maximizing net benefits is an economic concept aimed at sizing a project to the point where the greatest excess of benefits over cost occurs. For the purpose of determining the optimum scope of project, beach fills which provide protection to the shore from damage that were considered are: 20-, 40-, 65-, and 100-foot berm widths.

Plan Description

153. Materials for constructing each of the beach fills would be obtained from one or more of the potential offshore borrow areas or from the adjacent passes, as shown on plate C-2 of appendix C. The borrow locations and volume of material required for periodic nourishment would be indicated by island segment below.

Island Segment	Borrow Locations	Annual Quantity (cubic yards)
Honeymoon Island	Hurricane Pass Shoals	15,000
Caladesi Island	Hurricane Pass Shoals	10,000
Clearwater Beach Island	Clearwater Pass Shoals	10,000
Sand Key	Johns Pass/Offshore Borrow #1	56,000
Treasure Island	Offshore Borrow #1	50,000
Long Key	Blind Pass Shoals	50,000
Mullet Key	Offshore Borrow #1	30,000

154. These volumes of material are based on historic losses. Each of the considered beach fills would extend along the shore fronting Pinellas County as indicated. The volume of fill includes that required for the considered

section, that required to account for sorting losses (based on a fill factor of 1.10), and that required for advance nourishment. Details concerning the design and cost estimates are presented in appendix C & D.

Federal navigation projects are authorized for Johns Pass and Clearwater Pass. A Federal navigation project is proposed for Hurricane Pass. Federal navigation projects are maintained to authorized depths as needed. Suitable material from this work is generally spoiled on the adjacent beachs at no cost to non-Federal interests as it is the most economical disposal method. Nourishment of the shores of Honeymoon Island, Caladesi Island, Clearwater Beach Island, and Sand Key for beach erosion control will be accomplished with material excavated from bar areas offshore or adjacent to navigation projects, rather than from the nagivation channels. Any direct benefit to the navigation projects from excavation of the beach nourishment material would be indirect and be a small, incidental, and unquantifiable value. It was assumed that beach erosion control work was not combined with the navigation work for economic analysis purposes.

155. Annual benefits that would accrue from each of the alternatives stem from prevention of land loss, reduction in storm damage, elimination of the cost associated with existing erosion control structures, and increased recreational use of the beach. Annual cost associated with each of the plans include interest and amortization cost, the annual costs of periodic nourishment, and when applicable, the annual cost of dune maintenance. Details of benefit analyses and computation of annual cost are presented in appendix D.

156. A summary of the analysis of each of the considered plans is presented on table 9 and discussed in the following paragraphs:

157. 20-Foot Protection. The design cross section of a 20-foot protective beach would be a 20-foot-wide berm at a +6 feet m.l.w. elevation with a seaward slope of 1 vertical to 20 hroizontal (1V to 20H) to m.l.w. then 1V to 30H to the existing gulf bottom. The initial fill would be comprised of 80,000 cubic yards at Honeymoon Island, 80,000 cubic yards at Clearwater Beach Island, 2,206,000 cubic yards at Sand Key, and 150,000 cubic yards at Long Key (advanced nourishment and sorting losses). The cost of implementing this plan is displayed on Table 9.

158. 40-Foot Protection. The design cross section of this beach fill is a 40-foot-wide berm at an elevation of +6 feet with a seaward slope of 1V to 20H to m.l.w. thence 1V to 30H to existing gulf bottom. The initial beach fill would be comprised of 100,000 cubic yards for Honeymoon Island, 100,000 c.y. for Clearwater Beach Island, 2,670,000 c.y. for Sand Key, and 150,000 c.y. for Long Key. The cost of implementing this alternative is displayed on Table 9.

159. 65-Foot Protection. The design cross section of this beach fill would be a dune with a crown width of 20 feet at an elevation of +8.0 feet and a seaward slope of 1V to 5H to an elevation of +6.0 feet, thence a level berm of 25 feet with seaward slopes the same as those provided by 10-year protection. The landward slope of the dune would be 1V to 5H. The fill would be comprised of 169,000 c.y. for Honeymoon Island, 172,000 c.y. for Clearwater Beach Island, 3,250,000 c.y. for Sand Key, and 150,000 c.y. for Long Key. The cost of implementing this alternative is displayed on Table 9.

TABLE 9
SUMMARY OF BENEFITS AND COST
BEACH FILL ALTERNATIVE (S-2)

Segment	Alternative Berm Width (ft)	Annual Benefits 1/ Recreation	Other 2/	Total	Annual Cost 1/	Net Benefits 1/	B/C Ratio
Honeymoon Island	20*	0	799	799	228	571	3.5
	40	0	799	799	233	566	3.4
	65	0	799	799	253	546	3.2
	100	0	799	799	278	521	2.9
Clearwater Beach Island	20	578	383	961	242	719	4.0
	40*	578	673	1251	250	1001	5.0
	65	578	714	1292	297	995	4.4
	100	578	741	1339	358	981	3.7
Sand Key	20	4481	4198	8679	2325	6354	3.7
	40*	4481	5195	9676	2684	6992	3.6
	65	4481	5608	10089	3125	6964	3.2
	100	4481	6227	10709	3838	6871	2.8
Long Key	Advance and* Periodic Nourishment	154	330	484	392	92	1.2
Caladesi Island	Per Nour.*	0	760	760	51	709	14.9
Treasure Island	Per Nour.*	0	615	615	337	278	1.8
Mullet Key	Per Nour.*	891	0	891	224	667	4.0
Total Project	*NED Plan for Alternative S-2	6104	8372	14476	4166	10310	3.5

1/ Units of $1,000, based on 8 1/8 percent over 50 years.
2/ Includes damage prevention and loss of land prevention.

160. <u>100-Foot Protection</u>. The design cross section of this beach fill would be comprised of a dune with a 20-foot crown width at elevation +10.0 feet and a seaward and landward slope of 1V to 5H to elevation +6.0 feet. The seaward berm would be a level 40-foot berm with seaward slopes as noted in the 10-year protection. The beach fill will be comprised of 256,000 c.y. for Honeymoon Island, 265,000 c.y. for Clearwater Beach Island, 4,500,000 c.y. for Sand Key, and 150,000 c.y. for Long Key. The cost of implementing this alternative is played on Table 9.

Impact Assessment

161. To fulfill requirements of principles and guidelines, an impact assessment was performed to identify, measure, and compare the likely economic environmental and social effects of plan implementation. Analysis of these effects form the basis for evaluating the beneficial and adverse contributions of each structural alternative. The significant impacts of plan S-2 are compared against the most probable future without a project. The results are presented in table 11, with details in Appendix B.

162. Beach nourishment effects will be similar regardless of the width of beach, but the degree of effect may vary with increased beach width. A more detailed description of impacts is found in appendix B.

Evaluation and Trade-Off Analysis

163. Considering the data presented on table 9, the project which provides protection by a 40-foot-wide berm provides the greatest net benefits, except at Honeymoon Island. It should be noted that recreational benefits do not increase for the 65- and 100-foot projects due to limitations set by daily demands and parking. Therefore, additional cost for the increased project widths can not be offset by increased recreational benefits. For the purpose of selecting the beach fill with the least adverse environmental effects the 40-foot project would be selected due to the smaller size of the fill producing the least degree of impacts.

Implementation Responsibilities

164. The policy of Federal aid in the restoration and protection of shores against erosion is set forth in Publc Law 87-874, River and Harbor Act of 1962, which amended Public Law 826, 84th Congress. Under the provision of Public Law 87-874, Federal participation in the cost of a project for restoration or protection of State, county, and other publicly owned shore, parks, and conservation areas may be up to but not more than 70 percent of the total cost exclusive of land costs when such areas meet the following requirements:

a. Include a zone which excludes permanent human habitation;

b. Include, but are not limited to, recreational beaches;

c. Satisfy adequate criteria for conservation and development of the natural resources of the environment;

d. Extend landward a sufficient distance to include, where appropriate, protective dunes, bluffs, or other natural features which serve to protect the uplands from damages; and

e. Provide essential full park facilities for appropriate public use, all of which shall meet the approval of the Chief of Engineers.

Where the above criteria are not met, Federal contributions toward the cost of construction of protective works along publicly owned shores is authorized up to one-half of the cost, including periodic beach nourishment.

165. There is no existing authority for Federal participation in the cost of providing beach fill in front of privately owned shoreline unless significant public benefits would stem from the project. The 1970 Florida legislature, in realizing that this restriction would seriously limit the degree of Federal participation in local erosion control projects throughout the State, provided for converting private shorefront to public beach to qualify for maximum Federal legislature enacted the "Erosion Control Line" law that provides for the boundary line, between sovereignty lands of the State bordering on the Atlantic Ocean; the Gulf of Mexico; and the bays, lagoons, and other tidal reaches thereof and the upland property adjacent thereto, to be determined and fixed pursuant to beach restoration projects. By establishing an ECL, usually at existing mean high water or along the bulkhead line of severely eroded beaches, the design beach fill placed seaward of the line remains State-owned and with adequate public access would qualify as a public shoreline. The riparian rights of the upland owners are reserved except that the common law no longer operates to increase or decrease the proportions of any upland property lying landward of the line either by accretion or erosion or by any other natural or artificial process. Such areas would then be eligible for 50-percent Federal participation in the costs of construction of federally-authorized shore protection projects.

166. Apportionment of the cost of providing a beach fill is summarized by island segment on table 10. Honeymoon and Caladesi Islands would qualify for 70 percent Federal participation. The remaining shores would generally qualify for 50 percent Federal participation except as noted at Sand Key. The Federal participation on nourishment costs at Sand Key is 44 percent. This is due to the lack of public shorefront and access at Belleair Beach and Belleair Shores. If the existing access points in these communities are opened to the general public, and an ECL is established, Federal participation in Sand Key would then be 50 percent for the island. The indicated cost apportionment is based on the provision of parking spaces at Sand Key, public access points clearly marked at 1/2 mile intervals, and the establishment of an Erosion Control Line. The final apportionment would reflect actual shore ownership and use at the time of implementation.

167. <u>Federal Responsibilities</u>. The presently estimated Federal share of the total first cost of this alternative is $13,989,000, which is equivalent to 50.6 percent of the shared project cost and based on presently proposed shorefront ownership, access, and parking. In addition, the Federal Government would provide 52.7 percent of the cost of periodic beach nourishment, estimated to be $986,600 annually.

TABLE 10
SUMMARY OF COST APPORTIONMENT BEACH FILL ALTERNATIVE (S-2)
(Units of $1,000)

Item	Total Cost	Federal Cost	Federal Percent	Non-Federal Cost	Non-Federal Percent
Honeymoon Island					
Initial Cost 1/ 2/	820.0	574.0	70	246.0	30
Annual Cost					
I&A 3/	68.0	47.6	70	20.4	30
Periodic Nourishment	160.0	112.0	70	48.0	30
Total	228.0	159.6	70	68.4	30
Caladesi Island					
Initial Cost 1/ 2/	0	0	70	0	30
Annual Cost					
I&A 3/	0	0	70	0	30
Periodic Nourishment	51.0	35.7	70	15.3	30
Total	51.0	35.7	70	15.3	30
Clearwater Beach Island					
Initial Cost 1/ 2/	1047.0	523.5	50	523.5	50
Annual Cost					
I&A 3/	87.0	43.5	50	43.5	50
Periodic Nourishment	163.0	81.5	50	81.5	50
Total	250.0	125.0	50	125.0	50
Sand Key					
Initial Cost 1/ 2/	24955.0	12477.5	50	12477.5	50
Annual Cost					
I&A 3/	2069.0	1034.5	50	1034.5	50
Periodic Nourishment	615.0	270.6	44	344.4	56
Total	2684.0	1305.1	48.6	1378.9	51.4
Treasure Island					
Initial Cost 1/ 2/	0	0	50	0	50
Annual Cost					
I&A 3/	0	0	50	0	50
Periodic Nourishment	337.0	168.5	50	168.5	50
Total	337.0	168.5	50	168.5	50
Long Key					
Initial Cost 1/ 2/	828.0	414.0	50	414.0	50
Annual Cost					
I&A 3/	69.0	34.5	50	34.5	50
Periodic Nourishment	323.0	161.5	50	161.5	50
Total	392.0	196.0	50	196.0	50
Mullet Key					
Initial Cost 1/ 2/	0	0	70	0	30
Annual Cost					
I&A 3/	0	0	70	0	30
Periodic Nourishment 4/	224.0	156.8	70	67.2	30
Total	224.0	156.8	70	67.2	30
Total County					
Initial Cost 1/ 2/	27650.0	13989.0	50.6	13661.0	49.4
Annual Cost					
I&A 3/	2293.0	1160.1	50.6	1132.9	49.4
Nourishment	1873.0	986.6	52.7	886.4	47.3
Total	4166.0	2146.7	51.5	2019.3	48.5

1/ Initial cost of 40-foot protection, except at Honeymoon Island where 20-foot protection is recommended, and Mullet Key (see note 4).
2/ Does not include non-Federal cost of establishing ECL which is estimated to be nominal.
3/ Interest and amortization for 50 years at 8 1/8 percent.
4/ Nourishment of the 60-foot protection project.

168. Non-Federal Responsibilities. The presently estimated non-Federal share of the total first cost of the considered improvement is $13,661,000 which is equivalent to about 49.4 percent of the shared project costs and based on presently proposed shorefront ownership, access, and parking. This consists of all land and damage items, including relocations and alterations, whose presently estimated costs are nil, and fill placed landward of the ECL. The non-Federal cost of periodic sand replacement is estimated at $886,400 annually (47.3 percent) and is based on no fill being placed landward of the ECL on on private property.

169. Appropriate access and facilities, which should be clearly marked, including the previously discussed parking development (additional spaces), and public transportation to beach access points would be provided by the local sponsor as necessary for realization of the public benefits upon which Federal participation is based. The access and other facilities would be maintained for the life of the project which is 50 years.

170. Other general non-Federal responsibilities, such as indemnifying the United States, continuing public use of the project beach for which benefits are claimed in the economic justification of the project, and controlling water pollution to safeguard the health of bathers, must also be assumed by the non-Federal sponsor before a Federal project can be constructed.

Public Views

171. Public view concerning this and other alternatives are contained in appendix E.

COMPARISON OF DETAILED PLANS

172. Within the guidelines established by the study authority, the planned objectives, and the planning criteria discussed earlier three plans were developed in detail for beach erosion control along the Pinellas County gulf coast. They are:

- No action plan,
- Non-structural combination plan, and
- Beach fill with periodic nourishment.

173. Portions of the non-structural plan have been implemented at various local levels, and the remaining portions of the plan will likely be implemented in the future.

174. As previously discussed an "effect assessment" was carried out for each of the alternative plans. The overall assessment of impacts of each alternative on the four national accounts of NED, EQ, RED, and OSE is provided in Table B-1 of appendix B. These impacts on specific items are also presented as part of table 11 in the summary comparison of alternative plans. Specific impacts on EQ as measured on the area's resources are also shown on tables 11 and B-1 for each alternative. The following paragraphs summarize the overall impacts of each plan.

TABLE 11

EFFECT ASSESSMENT OF DETAILED ALTERNATIVES

Effect Categories	Beach Fill S-2	Non-Structural NS-12	No Action
Air Quality	Decrease with increasing crowds and traffic.	No Significant Effect (NSE)	No Significant Effect (NSE)
Noise Level	Increase during construction and with increasing crowds and traffic.	No Significant Effect (NSE)	No Significant Effect (NSE)
Water Quality	Temporary decrease during construction and during future periodic nourishment.	No Significant Effect (NSE)	No Significant Effect (NSE)
Manmade Resources	Enhance and add stability for existing and future development.	Reduced future development causes slight reduction in future to manmade resources.	Highways, buildings, and beach facilities subject to damage.
Natural Resources	Stabilize beaches; temporary disruption of aquatic ecosystem during construction and future nourishment.	Limits type of development on beach. Continued erosion effects existing beach.	Continued erosion, loss of vegetation and periodic scarping of dunes.

TABLE 11

EFFECT ASSESSMENT OF DETAILED ALTERNATIVES

Effect Categories	Beach Fill S-2	Non-Structural NS-12	No Action
Esthetic	Temporarily unsightly during construction and maintenance; esthetically unpleasing afterwards.	Continued erosion esthetically displeasing.	Continued erosion esthetically displeasing.
Community Cohension	Could result in strengthening existing community cohesion in lieu of sporadic development throughout other areas in the country and region.	Patterns of social and economic cohesion may be altered by continued erosion.	Patterns of social and economic cohesion may be altered by continued erosion.
Public Facilities	Will provide public recreation beach in front of existing public facilities - will probably result in the need for additional public facilities.	Continued erosion eventually affects available facilities.	Continued erosion eventually affects available facilities.
Public Services	Will increase commensurate with increased public use.	No significant change.	No significant change.

TABLE 11

EFFECT ASSESSMENT OF DETAILED ALTERNATIVES

Effect Categories	Beach Fill S-2	Non-Structural NS-12	No Action
Employment	Initial construction & periodic nourishment create new jobs for a short period of time. Tourist-based industry may increase.	Some loss with loss of recreational opportunity.	Some loss with loss of recreational opportunity.

175. As noted earlier, the "no action" alternative represents the without project conditions of the future. Under this alternative, erosion of the shoreline areas would continue. Storm generated waves attacking the southern shore would accelerate land loss and be limited to the seawalls constructed to halt erosion. However, overwash and failures would also adversely affect development behind the seawalls. In areas under development, it is anticipated that new seawalls would be constructed concurrent with the development as required. In addition to the damage, the erosion would also continue to reduce the existisng beach in both size and quality. This would adversely affect beach oriented recreation at Pinellas County because of the limited amount of public beach available and high beach usage in the area. Other impacts of this alternative would be mainly related to these aspects of the continued shoreline erosion.

176. The impacts of the structural alternative plan for beach restoration were discussed in preceding paragraphs and are summarized on table 11. Table B-1 shows each plan's overall contribution to the planning objectives. The contributions and impacts of plan NS-12 are similar to No-action, only somewhat less due to reduced future problems. In general, the structural plan has positive economic impacts which stem from the net benefits generated. Likewise, positive social impacts would occur from the reduced erosion and damage and increased recreational use. However, the structural plan would have some adverse effects on the environment due to the loss of borrow and construction site organisms. To help offset the loss of the organisms much of the initial fill and periodic nourishment will be obtained from shoal areas offshore of the navigation channels.

DESIGNATION OF NED AND EQ PLAN

NED Rationale Alternatives.

177. The NED plan is defined as the plan that reasonably maximizes net national economic development benefits, consistent with the Federal objective. Each alternative plan is formulated with consideration given to four criteria: completeness, effectiveness, efficiency, and acceptability (implementability). Selection of the recommended plan also includes consideration of the views of other Federal, State, and local agencies and groups.

178. NED Plan. Tables 11 and B-1 summarize all plans investigated in detail. As indicated, a beach fill alternative (S-2) is the NED plan for all island segments considered.

EQ Alternatives

179. Rationale. The Environmental Quality (EQ) plan by definition is the plan which most emphasizes environmental contributions and, at a maximum, makes net positive contributions to the EQ account while still satisfying the planning objectives. This plan would emphasize the development of project components to provide management, conservation, preservation, creation,

restoration, or improvement of the quality of natural and cultural resources and ecological systems, while addressing traditional water resource needs.

180. EQ Plans. None of the plans investigated could qualify as the EQ plan. The no-action alternative and the nonstructural plan would avoid inflicting any additional damage or stress to natural resources. However, if no remedial action is taken, the loss of beach to erosional forces will continue and the threat to human life and property will increase. The nonstructural combination plan includes features that would contribute to EQ goals and some have been adopted by local and State authorities and others are under study. But adoption of the entire plan is not economically practical or socially acceptable and would be opposed by various institutional interests. The alternative providing stabilization for the existing shore which fronts Pinellas County by the placement of initial fill and subsequent nourishment will result in some environmental damage and stress but these will be controlled and reduced to the greatest extent possible. Meanwhile, the public beach, the area's key recreational resource, will be preserved and enhanced and the threat of loss of property substantially minimized. Accordingly, this alternative was designated as the environmentally preferred plan.

SELECTING A PLAN

Rationale

181. Socioeconomic and environmental criteria for consideration in water resource planning are as prescribed by the National Environmental Policy Act of 1969 (Public Law 91-190) and Section 122 of the River and Harbor and Flood Control Act of 1970 (Public Law 9-611). The criteria prescribe that all significant adverse and beneficial economic, social, and environmental effects of considered erosion control solutions be considered and evaluated when selecting a plan for recommendation as a Federal project. The highlights of these criteria, which were presented earlier in this report, are summarized in the following paragraphs.

182. The economic criteria require that the selected plan be justified with sufficient benefits to exceed the costs and that the selected plan would be the most economical means of meeting the planning objectives.

183. Planning criteria also require that the selected plan must be technically and institutionally implementable. The institutional authority, financial capability, and the social acceptability of actions taken by the non-Federal sponsor must be sufficiently established to allow recommendation of the selected plan as a Federal project with knowledge that it can be implemented. The plan must be acceptable to and indorsed by State and local authorities as a comprehensive solution for an erosion control management measure.

184. The possible consequences of the detail alternatives have been studied for environmental, other social effects, and economic effects, including

regional and national economic development and engineering feasibility. The need for protective erosion control works along the eroding shores fronting Pinellas County project has been established. The evaluation of the viable alternatives, the following points were considered pertinent:

185. Environmental Considerations. Completion of the selected alternative for beach restoration and nourishment would result in enhancement of the human environment in terms of beach-related recreational activities and the safety, health, and economic well-being of the local area population. However, this would be achieved at the cost of some losses and temporary stress to littoral and benthic biota. It should be noted that where possible fill material will be obtained from shoal areas offshore of the navigation project channels, thus minimizing the effect on benthic biota.

186. Animal life directly affected by the project would include the benthic-invertebrates associated with the offshore borrow areas and within the reach of beach to be filled. The less motile invertebrates in the borrow areas would be destroyed. However, in the beach fill areas, organisms are capable of upward burrowing and surviving during and after construction. Organisms similar to those destroyed would probably reestablish within 6 to 18 months following completion of the operation. Fishes would tend to be less affected directly by the project than benthic organisms. The overall impact would be minor since fish are able to avoid most of the adverse impacts associated with dredging and filling activities. Turbidity caused by dredging and filling operations would result in minor impacts on water quality and biota but would be of a temporary nature, ending with project completion. The same temporary effects would occur during periods of renourishment.

187. Various measures to minimize the adverse effects of the proposed dredge-and-fill operation have been incorporated into planning and other methods are under study. Environmental protection measures utilized to date in the Pinellas County project will be continued in restoration of the beach. These mesures include predredging surveys to locte and map hard bottoms, sand borrow areas, and other habitat; precision positioning of the dredge to prevent mechanical damage to hard bottoms; conveying dredge-support equipment to the dredge site in a manner that avoids scarring the ocean bottom; and careful selection of borrow areas to insure a minimum amount of fines suspension. Diking of beach fill to reduce inshore sedimentation will be utilized where studies show if it is effective. Specific requirements designed to protect hardground communities from damage would be included in the dredging contract. In addition, monitoring programs to establish the impacts of the construction activities on the overall environment will be included as part of the project.

188. The area bird population should escape most of the adverse effects resulting from dredging operations. Construction activities may initially frighten some bird species away; but on the other hand, numerous species would be attracted to the area to feed upon organisms brough to the surface during dredging operations.

189. Corps investigations and coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service have established that no endangered or threatened botanical or zoological species are expected to be adversely affected by the project. Provisions to protect manatees and nesting sea turtles will be incorporated in dredging contracts.

190. There are no known objects of archeological or historical signficance located within the borrow sites.

191. Other Social Effects. Resolution of the problem of continued erosion along the project shoreline would result in improved social well-being of shorefront property owners whose homes and development would be removed from jeopardy. The resulting advantages gained through creation of additional public beach frontage for recreational use could be considered a trade-off for temporary environmental losses.

192. Engineering Considerations. The beach fill alternative plan as described in this report, represents the most practicable and economical plan of protecting the eroding ocean shores of Pinellas County. It represents the most feasible project possible for the intended purpose and maximizes conservation and use of restored natural resources.

193. Economic Considerations. Study findings indicate no future need for improvements greater than selected. Lesser improvements would not provide the protection needed. Economic analysis are summarized on tables 9 and 10.

Selection of Plan

194. Of the alternatives investigated, the beach fill alternative plan of protection is considered to provide the optimum solutions within the framework of the formulation concepts.

195. The Selected Plan. The selected plan provides for modification of the existing Pinellas County Beach Erosion Control project to provide for the following:

a. A protective and recreational beach along 4,500 feet of gulf shore at Honeymoon Island and including periodic nourishment of the island for the project life.

b. Periodic nourishment along the 2.1 mile gulf shoreline of Caladesi Island for the project life.

c. A protective and recreational beach along 5,000 feet of gulf shore at Clearwater Beach Island and including periodic nourishment of the 3.1 mile shoreline of the island for the project life.

d. A protective and recreational beach along 7.3 miles of gulf island shore at Sand Key and includes periodic nourishment of the 14.2-mile shoreline of island for the project life.

e. Extension of the period of Federal participation in the cost of nourishing the existing project works for Treasure Island (3.5 miles) through project life.

f. Extension of the period of Federal participation in the cost of nourishing the existing project works for Long Key (4.1 miles) through project life.

g. Inclusion of periodic nourishment of the gulf and bay shorelines (5.5 miles) Mullet Key through project life.

196. Details of the plan selected for Pinellas are shown on plates 2 through 5 and data pertinent to the plan are summarized on tables 12 and 13. The initial beach fill would provide protection to the shore from erosion that would accompany a storm with a return interval of 9 years for Honeymoon Island and Mullet Key and 11.1 years for Clearwater Beach Island, Sand Key, Treasure Island and Long Key and 15 years for Mullet Key. In fill areas such as Sand Key, there are numerous groins of various lengths and types. The 40-foot berm project fill would provide a dry beach width of 124 feet, which would completely cover the typically short groins constructed in the area. Those groins that would protrude from the fill cross-section would be partially dismantled. With the project fill in place, the existing groins would therefore serve no function.

197. Items of local cooperation include the provision of parking spaces and public access points strategically located along the considered reach of shore. The percentages of apportioned cost are for project cost only. Outside project cost are recognized but are not included in the Authorized Project Cost Sharing. However, the percentages are adjusted at the time of construction with outside project scope cost assigned 100 percent to the local sponsor for the following reasons:

a. The erosion control line is not established until after project authorization and prior to construction. The location of the line is established by the trustees of the Internal Improvement Trust Fund generally at the mean high waterline. However, in the event riparian owners agree to furnish fnancial or other acceptable assistance in the beach restoration project the location of the line can be located seaward of the mean high waterline. Federal law does not provide for including the variable cost of fill landward of the erosion control line, which falls under the classification of lands, easements, rights-of-way, and relocations, in the Authorized Project Cost Sharing.

b. Shorelines authorized for Federal projects are subject to erosion and storm damage between authorization and construction. Anticipated shoreline changes do effect differences that cannot be quantified nor do Federal laws and guidelines provide for including of these cost in the Authorized Project Cost Sharing.

TABLE 12

PERTINENT DATA
SELECTED PLAN

Segment (Plan)	Length of Initial Fill (mile)	Volume of Initial Fill (cy.)	Length of Periodic Nourishment (miles)	Volume of Periodic Nourishment (cy/5 yrs)	First Cost ($1000)	Annual Cost ($1000)	Annual Benefits ($1000)	B/C
Honeymoon Island	.85	80,000	2.6	75,000	820.0	228.0	799.0	3.5
Caldesi Island	-	-	2.1	50,000	-	51.0	760.0	14.9
Clearwater Beach Island	.95	100,000	3.1	50,000	1047.0	250.0	1251.0	5.0
Sand Key	7.3	2,670,000	14.2	280,000	24,955.0	2684.0	9676.0	3.6
Treasure Island	-	-	3.5	250,000	-	337.0	615.0	1.8
Long Key	.5	150,000	4.1	250,000	828.0	392.0	484.0	1.2
Mullet Key	-	-	5.5	150,000	-	224.0	891.0	4.0
Total Selected Plan	9.6	3,000,000	35.1	1,105,000	27,650.0	4166.0	14,476.0	3.5

TABLE 13
SUMMARY OF COST APPORTIONMENT
SELECTED PLAN
(Units of $1000)

ITEM	TOTAL COST	FEDERAL COST	FEDERAL PERCENT	NON-FEDERAL COST	NON-FEDERAL PERCENT
Honeymoon Island					
Initial Cost	$ 820.0	$ 574.0	70	$ 246.0	30
Annual Nourishment	160.0	112.0	70	48.0	30
Caladesi Island					
Annual Nourishment	51.0	35.7	70	15.3	30
Clearwater Beach Island					
Initial Cost	1,047.0	523.5	50	523.5	50
Annual Nourishment	163.0	81.5	50	81.5	50
Sand Key					
Initial Cost	24,955.0	12,477.5	50	12,477.5	50
Annual Nourishment	615.0	270.6	44	344.4	56
Treasure Island					
Continued Nourishment	337.0	168.5	50	168.5	50
Long Key					
Initial Cost	828.0	414.0	50	414.0	50
Continued Nourishment	69.0	34.5	50	34.5	50
Mullet Key					
Annual Nourishment	224.0	156.8	70	67.2	30
Total Project					
Initial	27,650.0	13,989.0	50.6	13,661.0	49.4
Nourishment	1,873.0	986.6	52.7	886.4	47.3

c. The provision for adjusting the actual cost sharing at the time of construction is contained in paragraph 202, local assurance a., of this report and HD 591/89/2.

d. Should the local sponsor elect to fill the area landward of the ECL to project fill elevations at 100% non-Federal cost the value of the land filled is increased and such enhancement benefits are added to the total project benefits. Such cost are therefore self-liquidating.

198. In addition, the plan provides for the measures discussed in paragraphs 185-190 and summarized below for minimizing adverse affects on the environment.

a. During advanced engineering planning detail field work will be accomplished to map hard bottoms and establish base conditions. The result of this work will be used to select an offshore borrow site which will result in the least damage to the marine environment and to provide a base to compare the results of postconstruction monitoring. Mapping will be accomplished utilizing side scan sonar coupled with other methodologies as appropriate.

b. Monitor offshore borrow area immediately following dredging, 6 months following dredging, and 1 year following dredging. The purpose of these monitoring efforts is to determine the immediate effects on the marine environment and to estimate the long-term effects.

c. Within the existing state of the art, dredging techniques will be specified and employed which will minimize the amount of damage to the marine environment.

d. Dredge-support equipment will be conveyed to the dredge site in a manner that minimizes scarring of the ocean bottom.

199. Flood Plain Development. The recommended plan is in the base flood plain (100-year flood) and has been evaluated in accordance with Executive Order 11988. Relocation of the proposed project outside the flood plain would not be responsive to the problems and needs of the study area and was not considered further. A nonflood plain alternative for the potential development with the project would be to restrict all future development to those areas outside the flood plain or elevated above the flood plain. Potential flood plain development with the project would be restricted as a result of local building ordinances and State law. Any induced potential damage as a result of project implementation would be minimal. The proposed project complies with applicable State and local laws and regulations concerning flood plain protection standards. The projects would have minimum impact on the natural and beneficial values of the flood plain. In the without project flood plain (that area immediately adjacent to the proposed projects), there will be minimal loss of natural resources due to potential development. Implementation of the nonstructural combination plan would minimize potential damage to or within the flood plain. Local interests

have adopted many parts of the nonstructural plan and are considering others. Implementation of the nonstructural plan is a local responsibility. A general listing of involved agencies, groups, and organizations is provided in appendix E.

200. Institutional Considerations. The legal capability of the non-Federal sponsors, Board of County Commissioners and the State of Florida, to assume non-Federal responsibilities is specfically defined in State law. The county is a State political subdivision, duly constituted the Beach and Shore Preservation Authority for Pinellas County, with the authority to enter into contract with the Secretary of the Army and to provide the non-Federal requirements for implementing the selected plans.

201. Conclusions. I have given consideration to all significant aspects in the overall public interest, including engineering feasibility, and economic, social and environmental effects. The selected plan described in the report provides the optimum solution for the protection of the eroded shores of Pinellas County within the framework of the formulation concepts.

RECOMMENDATIONS

202. It is recommended that the existing Pinellas County Beach Erosion Control Project (HD 519/89/2) be modified to include improvements for beach erosion control along the shores of Honeymoon and Caladesi Islands in accordance with the selected plan described in this report with such modifications thereof as in the discretion of the Chief of Engineers may be advisable. This recommendation is made with the provision that local interests will:

FOR THE CLEARWATER BEACH ISLAND, SAND KEY, TREASURE ISLAND, AND LONG KEY SEGMENTS -

Comply with the elements of local cooperation specified in HD 519/89/2 except that Federal participation in periodic nourishment costs is extended from ten years to project life.

FOR THE MULLET KEY SEGMENT -

Comply with the elements of local cooperation specified in HD 516/89/2 except that Federal participation in periodic nourishment costs is extended from ten years to project life.

FOR THE HONEYMOON ISLAND AND CALADESI ISLAND SEGMENTS -

a. Contribute in cash the required percentages of the first costs of construction (including contract price, engineering and design, and supervision and administration, and excluding the costs of land easements, rights-of-way, and relocations), the percentages to be in accordance with existing law and based on shore ownership and use existing at the time of implementation. Contributions are to be paid in a lump sum or in installments prior to the start of pertinent work items in accordance with construction schedules required by the Chief of Engineers, the final apportionment of costs to be after actual costs have been determined;

b. Contribute in cash amounts computed in accordance with cost sharing provisions contained in Public Law 826, Eighty-fourth Congress, as amended by Public Law 87-874, for beach nourishment costs for the life of the project, such contributions to be prior to each nourishment operation;

c. Provide at their own expense all necessary lands, easements, rights-of-way, and relocations required for construction and subsequent nourishment and maintenance of the project;

d. Assure continued public ownership and use of the shore upon which the amount of Federal participation is based, and its administration for public use during the economic life of the project;

e. Hold and save the United States free from all claims for damages due to construction and maintenance of the project except damages due to the fault or negligence of the United States or its contractors;

f. Provide an adequate width of beach in public ownership for public use fronting private property as a requirement for Federal participation in projects for shores presently in private ownership with acceptable access, parking areas, and other facilities necessary for public use.

g. Comply with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646).

203. Additionally, it is recommended that Long Key and Sand Key segments be modified as described by the selected plan in this report with such modifications to include structures if warranted by further study as in the discretion of the Chief of Engineers may be advisable.

204. It is also recommended that the existing Pinellas County project (HD 591/89/2) be modified to include an extension of Federal participation in periodic nourishment costs from the authorized 10 years after initial construction to project life subject to the items of local cooperation presently in effect.

205. It is also recommended that construction authorization of the recommended modifications be subject to cost-sharing and financing arrangements with the responsible non-Federal agencies supporting the project which are satisfactory to the President and the Congress.

206. The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities

inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation funding.

ALFRED B. DEVEREAUX, JR.
Colonel, Corps of Engineers
Commanding

FINAL

ENVIRONMENTAL IMPACT STATEMENT

Beach Erosion Control Project Review Study

for Pinellas County, Florida

Responsible Federal Agency: U.S. Army Corps of Engineers, Jacksonville District

ABSTRACT: The western shorelines of seven Pinellas County barrier islands are undergoing severe erosion as a result of winds, waves, and currents. The following alternative courses of action were selected for detailed study: no action (NS-1), a nonstructural combination plan (NS-10), and beach fill with periodic nourishment (S-2). Two dredging methods, hydraulic and dragged blade (Sauerman Dredge), were considered for obtaining the fill material. Two offshore shoals and all the passes (6) between the subject islands were considered as fill material sources. After thorough analysis, the beach fill with periodic nourishment plan (S-2), one dredging method (hydraulic), and borrow areas consisting of the two offshore shoals and four of the six passes were selected. This combination offers the most feasible means of controlling the erosion problem at an acceptable cost, and this combination has the potential for meeting the objectives of National Economic Development.

Comments on this document should be sent to the District Engineer by ____________. For further information about this statement, please contact Mr. Ronnie Tapp, Environmental Studies Section, U.S. Army Corps of Engineers, P.O. Box 4970, Jacksonville, Florida 32232; Commercial telephone (904) 791-1690, FTS telephone 946-1690.

NOTE: Information, displays, maps, etc., discussed in the Beach Erosion Control Project Review Study for Pinellas County, Florida (Main Report) are incorporated by reference in the EIS.

(REV DEC '84)

SUMMARY

In response to a request from the Pinellas County Board of County Commissioners (local sponsor) and authorization by Congressional Resolution, a study was performed to determine the feasibility of controlling erosion and of providing storm protection on five barrier islands (Clearwater Beach, Mullet Key, Treasure Island, Sand Key, and Long Key) off the Gulf of Mexico coast of Pinellas County, Florida. The Florida Department of Natural Resources requested the inclusion of two more of the county's barrier islands (Honeymoon and Caladesi), and this was done.

The shoreline erosion has reduced the economic value of the islands and storm protection for manmade structures on four of the islands. Mullet Key is a county recreation area, and the remaining islands (Honeymoon and Caladesi) are State-developed public parks. The unique and common pertinent features of these shorelines, the known structural and nonstructural actions that could cause the desired effects, the pertinent environmental considerations, and the associated economic considerations were combined to derive eight nonstructural alternatives, nine structural alternatives, and the without-conditions (No Action) alternative.

Major Conclusions and Findings.

This study finds that the control of erosion and the provision of storm protection on these shorelines through the use of methods that cause minimum environmental damage and at an acceptable cost are feasible. The selected plan calls for the use of the two offshore shoals and four of the passes (Blind Pass, Johns Pass, Clearwater Pass, and Hurricane Pass) as fill material sources. Only the hydraulic dredging method would be used. Beach restoration and/or periodic nourishment fills would be used on each of the seven shoreline segments.

The selected plan qualifies as the study's National Economic Development Plan since it has the best potential of the considered alternatives for providing economic benefits to the region and protecting the environment. It would also protect the area's cultural resources and enhance and maintain the esthetic values of the area. The area's aquatic environment would not be significantly altered by the selected plan. The Section 404 Evaluation of the selected plan found no conflict with the restrictions on discharge (attachment A).

a. Endangered and Threatened Species. Coordination with the U.S. Fish and Wildlife Service resulted in an agreement on a set of protective measures that would be used to protect manatees and sea turtles during the selected plan's activities.

b. Pinellas County Shoreline. The selected plan would restore and/or maintain selected areas of the shoreline, and it would enhance the shoreline's appeal and ability to provide beach type recreation.

c. Water Quality. Temporary turbidity and low oxygen conditions would occur at the dredging and fill sites; however, no significant adverse effects on water quality are expected.

d. Archeological and Cultural Resources. No significant sites have been identified in the study area except for Fort DeSoto at the southern end of Mullet Key. The selected plan would prevent the Fort from being undermined and damaged by erosion.

e. Economy. The selected plan would provide the most desired results at an acceptable cost. The plan would enhance those characteristics that attract tourists and retirees; therefore, the local economy would receive significant support.

Area of Controversy. There were no major disagreements among the public interests during this study.

Unresolved Issues. Since there were no major disagreements during this study, there are no unresolved issues.

Relationship to Environmental Protection Statutes and Other Environmental Regulations. Refer to Table 4-1. The requirement for water quality certification is waived since this proposal meets the exemption criteria of Section 404(r) of the Clean Water Act.

FINAL

ENVIRONMENTAL IMPACT STATEMENT

Beach Erosion Control Project Review Study

for Pinellas County, Florida

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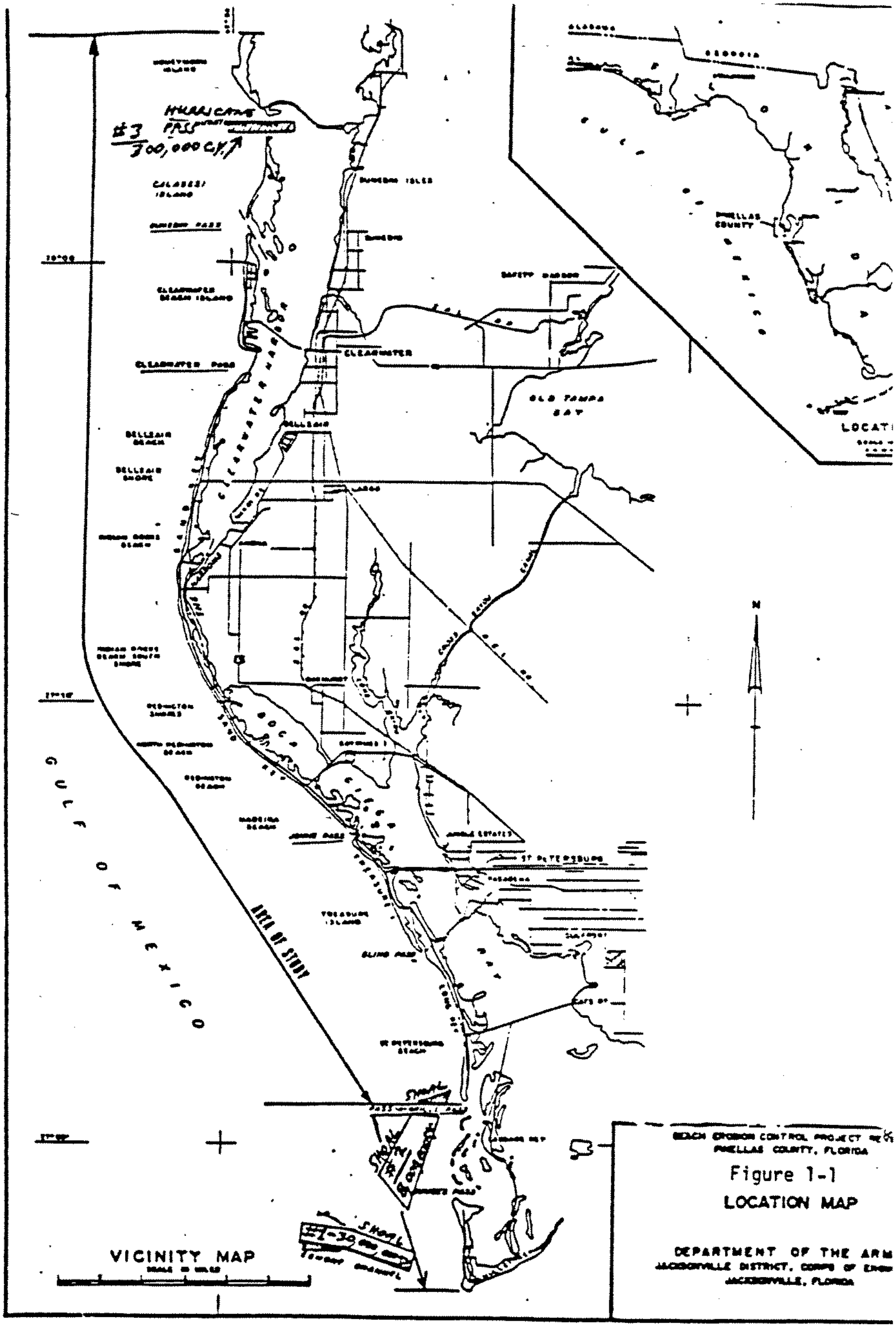
NEED FOR AND OBJECTIVES OF ACTION

1.00 Need for and Objectives of Action.

1.01 Study Authority. The Senate Public Works Committee Resolution of 4 March 1976 and the House Public Works Committee Resolution of 23 September 1976 authorized a review of the existing beach erosion control project for Pinellas County, Florida as described in (HD 519/89/2) with particular reference to the advisability of extending Federal participation in the periodic nourishment costs for five barrier islands. the islands are elongate and parallel to the Gulf Coast of Pinellas County in a north-to-south string. The islands are Mullet Key, Long Key, Treasure Island, Sand Key, and Clearwater Beach Island. During a public meeting in Clearwater, Florida, on 30 March 1978, the Florida Department of Natural Resources requested two additional islands (Honeymoon Island and Caladesi Island), located on the northern end of the island string, be included in the study. The study area is shown on Figures 1-1, 1-2, 1-3, and 1-4.

1.02 Public Concerns and Related Resources Management Needs. The local sponsor for this project is the Pinellas County Board of County Commissioners. Shoreline erosion and a lowered beach profile caused by storms, wave action, and currents have become a serious concern with the increase in private and commercial development near these shorelines and with the increased use of these shorelines for recreational purposes. The combination of receding shorelines and decreasing beach profiles increases the vulnerability of people and their property to storm damage. These conditions also reduce the subject shorelines' appeal for recreational use. Private property owners and affected municipalities on the islands have slowed down, but not stopped, the erosion by building seawalls and groins and by discharging fill material along some of the shorelines. Federal funds were provided in 1969 and in 1973 for emergency beach fills to replace storm eroded areas at Indian Rocks Beach on Sand Key. The resource with a primary need for management in this case will be the replaced and/or maintained shorelines. The fill material source areas constitute the second resource requiring management. A concern exists for the selection of borrow areas in that the preferred nearby offshore areas would realize a decrease in water quality (lowered dissolved oxygen and lowered biological productivity) if dredged to an excessive depth. A second concern is that one of the alternative borrow methods, the dragging of a scraper blade from a point offshore towards the shore to pull sand up onto the beaches (Sauerman Dredging), would significantly damage and disrupt the benthic organisms and their habitat.

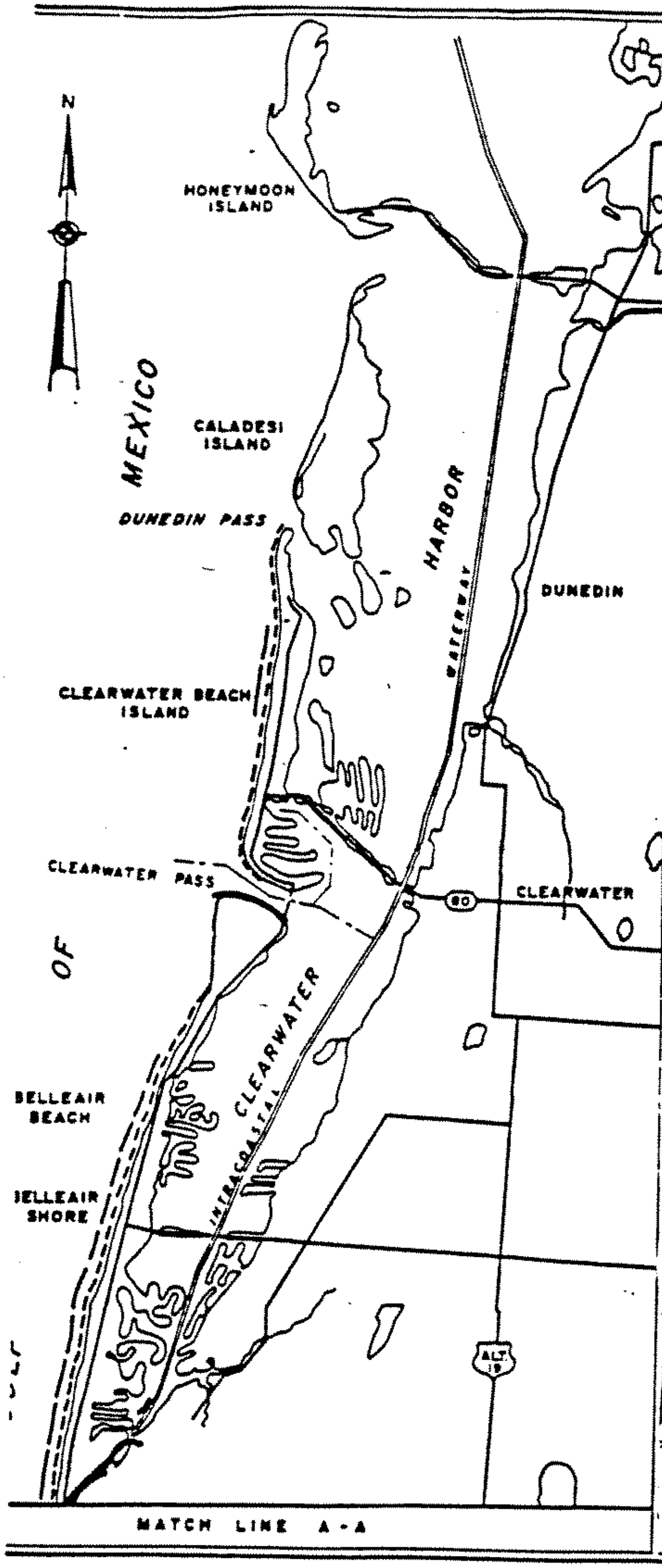
1.03 Planning Objectives. The Planning Objectives for the study are based on the public concerns and resources management needs listed in paragraph 1.02 above, and they were used to formulate the alternative plans. The Planning Objectives for this study are to determine the least environmentally damaging methods for the efficient and economical provision of effective shoreline erosion control, the restoration and maintenance of the esthetic and recreational appeal of shorelines, and the provision of protection against coastal storm damage for private, public, and commercial property.

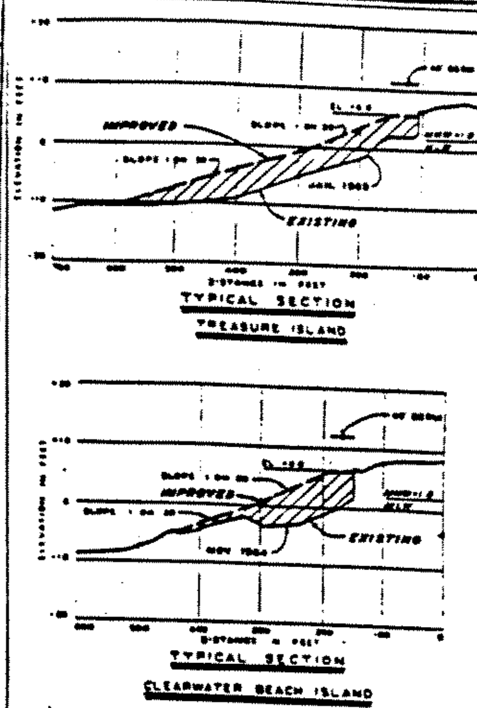


BEACH EROSION CONTROL PROJECT RE
PINELLAS COUNTY, FLORIDA

Figure 1-1
LOCATION MAP

DEPARTMENT OF THE ARM
JACKSONVILLE DISTRICT, CORPS OF ENGI
JACKSONVILLE, FLORIDA





PROJECT: Provides for Federal participation in improving and protecting the shores of Pinellas County, Fla., by restoration of 5,000 feet of shore on Clearwater Beach Island; restoration of 49,000 feet of shore on Sand Key; restoration of 9,200 feet of shore on Treasure Island; nourishment of 5,600 feet of shore on Long Key; construction of 600 feet of revetment on Long Key; and periodic nourishment of each island as needed. Federal participation would range from 1 9 percent to 50 percent depending on beach ownership within project limits.

MEAN TIDAL RANGE: 1.8 feet

AUTHORIZATION FOR EXISTING PROJECT

ACTS	WORK AUTHORIZED	DOCUMENTS
7 Nov. 1966	Federal participation in cost of a shore-protection project.	H. Doc. 519/89/2

Figure 1-2
Location Map, North

PINELLAS COUNTY, FLA.
BEACH EROSION CONTROL

SCALE IN MILES
1 0 1 2

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

30-7

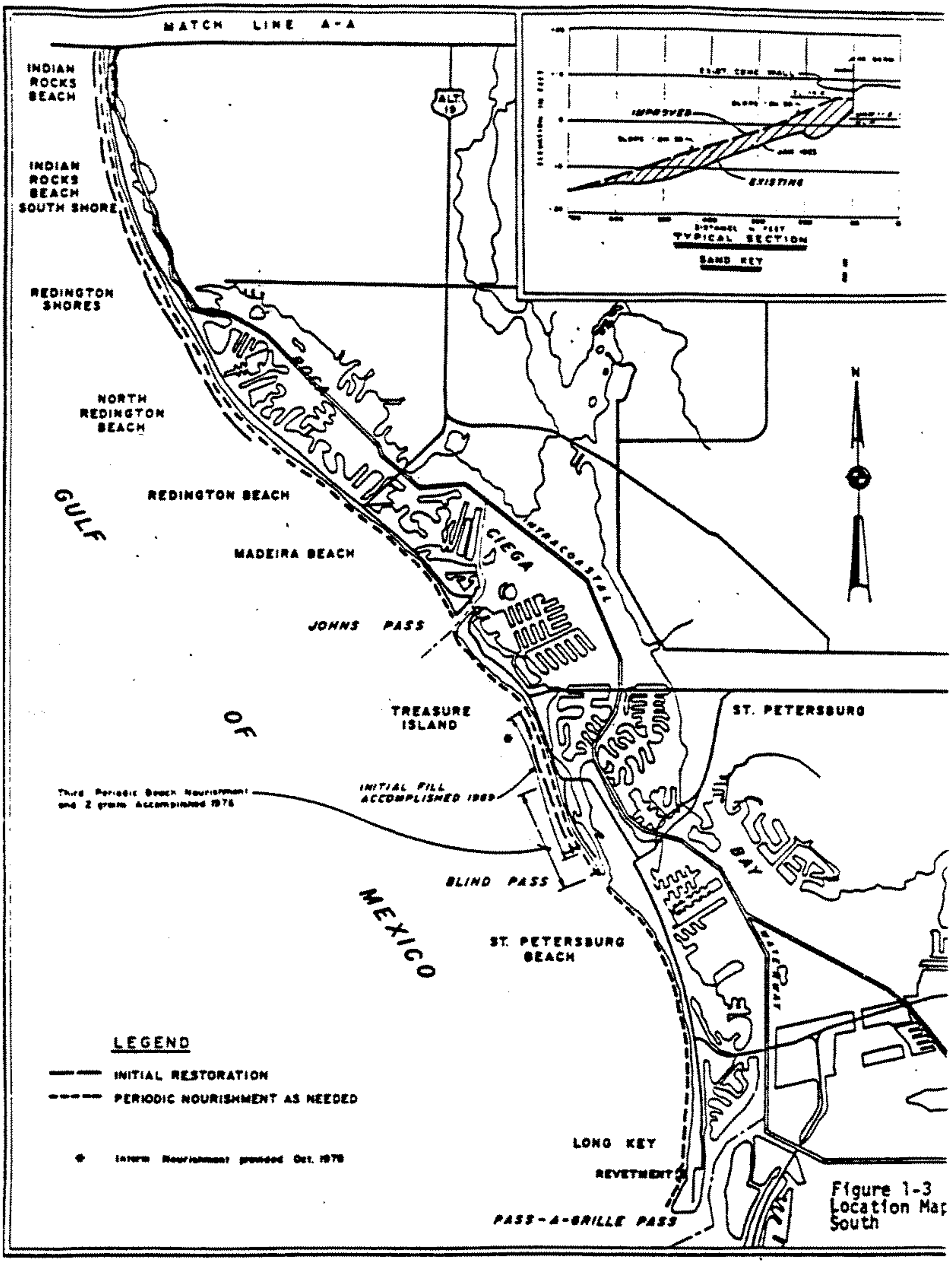


Figure 1-3
Location Map
South

CORPS OF ENGINEERS

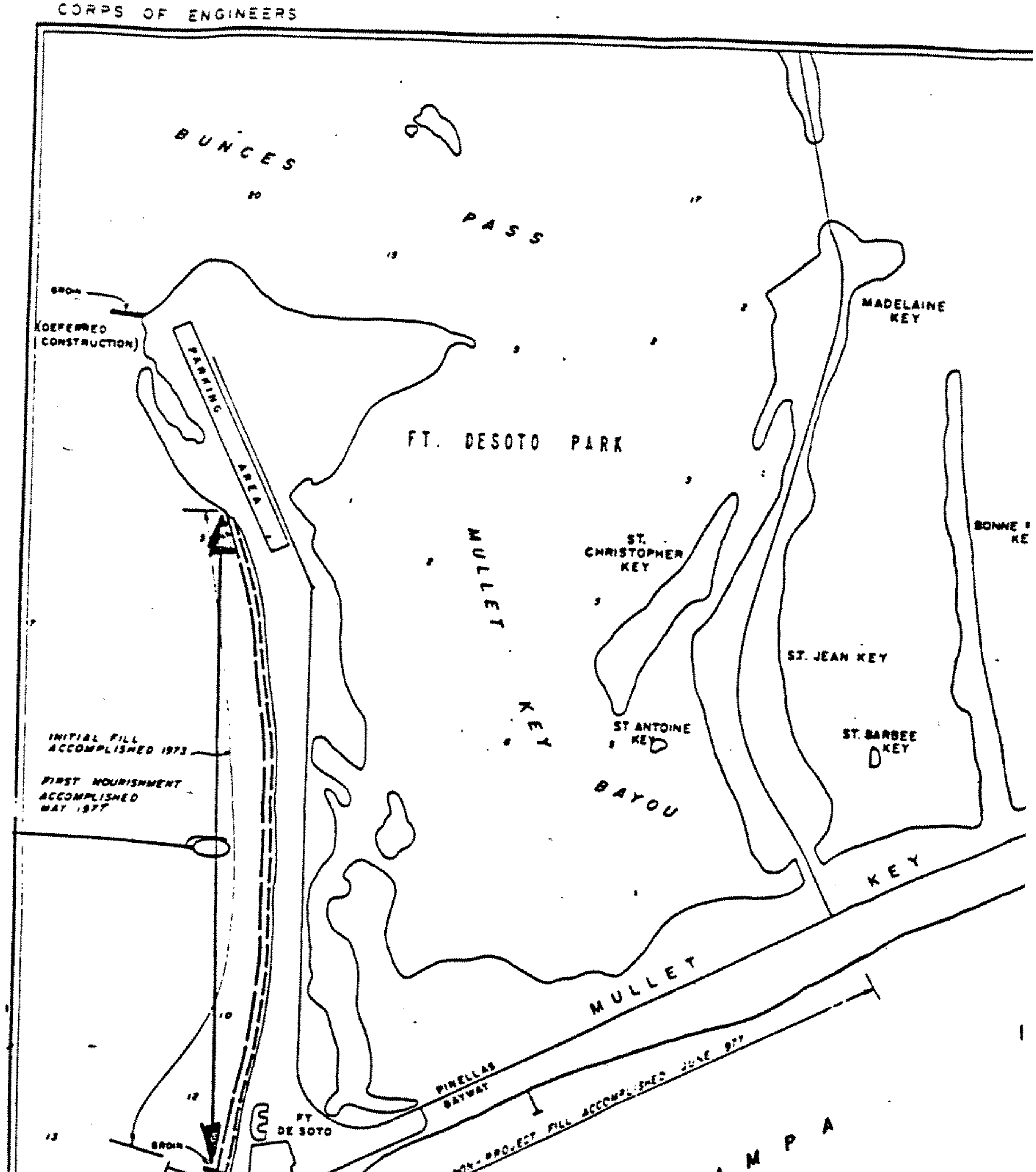


Figure 1-4
Location Map,
Mullet Key

1.04 Decision Required for the Proposed Action. A choice of one of the following possible decisions is required.

a. To take no action.

b. To implement the selected plan.

c. To implement an alternative combination of considered alternative actions.

1.05 A thorough environmental analysis of all the pertinent available data was performed using a systematic, interdisciplinary approach, and all relevant information is documented herein or is referenced to the appropriate source.

1.06 This document is organized according to the format for an Environmental Impact Statement (EIS) given in 40 CFR 1500 by the Council on Environmental Quality. The Cover Sheet contains an abstract of this document, lists the responsible Federal Agency, and gives an address where comments on this EIS may be sent. A summary is provided for those who do not wish to read the entire EIS document. The summary is followed by the Table of Contents, the List of Figures (location maps), and the List of Tables. This section (Need for and Objectives of Action) explains who wants to do what and why. It explains the Corps' involvement, the Public Issues, and the Planning Objectives. The Alternatives Section lists and discusses all reasonable alternatives that could be formulated in response to the stated purpose and need. The Affected Environment Section follows, and it describes the environment of the study area that could be affected by the alternatives discussed in the previous section. The next section, Environmental Effects, forms the scientific and analytic basis for the comparison of the alternatives. The document closes with a list of the people who contributed to the document's production, a description of the public's involvement in the production of this document, a notice of how comments on this document will be handled, an index, a list of references, and the appendixes section. The Section 404(b) Evaluation Report for this study is in the Appendixes Section.

2.00 Alternatives. Paragraph 2.01 describes the alternatives considered but rejected and why they were rejected. Paragraph 2.02 describes the No Action alternative. Paragraphs 2.03 and 2.04 describe, evaluate, and compare the alternatives considered in detail. Paragraph 2.05 describes the plans for the procurement of fill material. Paragraph 2.06 identifies the selected plan and explains how it was selected. Paragraph 2.07 describes how the selected plan would be applied. Paragraphs 2.08 and 2.09 identify the National Economic Development Plan and the Environmental Quality Plan respectively. The comparative impacts of the considered alternatives are addressed in paragraph 2.10, and the implementation responsibilities are noted in paragraph 2.11.

2.01 Nonstructural and Structural Alternatives Eliminated from Further Study. Table 2-1 lists these alternatives and indicates to what extent, if any, each meets the planning objectives. Detailed descriptions and evaluations of these alternatives are contained in the Main Report beginning at paragraph 115.

2.02 Without Conditions (No Action Alternative) (NS-1). The "no action" alternative would allow the continuation of the natural erosion and shoaling process currently affecting the islands. This alternative would not provide relief from the problems and dangers affecting the inhabitants and their property. The local sponsor opposes this alternative for these reasons. This plan, representing the base-line conditions, is retained only for comparison with the considered alternatives.

2.03 Nonstructural (NS) Plans Considered in Detail.

2.03.01 Rezoning of Beach Areas (NS-2). Structures built on the islands after the plan was implemented would be less vulnerable to storm damage because of the rezoning requirement for location in relatively safer areas. This alternative would not provide erosion control or protection from tidal flooding.

2.03.02 Modification of Building Codes (NS-3). This alternative would require hurricane proofing of new structures and would contain limited provisions for hurricane proofing of previously built structures. This alternative would not provide erosion control or protection from tidal-flooding.

2.03.03 Construction Setback Line (NS-4). This alternative requires that all new structures built on these islands be placed landward of a line determined to border a relatively storm-safe area on each of the islands. No provision can be included for existing structures. This alternative would not provide erosion control or protection from tidal flooding.

2.03.04 Flood Insurance (NS-6). This alternative would reduce the monetary loss by island property owners that experience property damage due to tidal flooding. This alternative would not provide erosion control or protection from tidal flooding.

2.03.05 Evacuation Planning (NS-7). This alternative would provide an early warning system for approaching storms and an escape route for the area's inhabitants. This alternative would not provide erosion control or protection from tidal flooding.

2.03.06 Various Nonstructural Combinations (NS-10). All of the considered nonstructural plans (NS-2, NS-3, NS-4, NS-6, and NS-7) would be beneficial to the study either singly or in any possible combination, but they would not provide erosion control or storm flooding protection for existing structures.

TABLE 2-1

ALTERNATIVES ELIMINATED FROM DETAILED STUDY FOR PINELLAS COUNTY, FLORIDA, GULF COAST BEACH EROSION CONTROL PROJECT

Alternatives	1/ Local Planning Objectives				2/ Other Objectives		
	RB	FP	EC	TBE	NED	OSE	RD
			Nonstructural (NS)				
NS-5 (Moratorium on construction)	0 3/	P	0	0	0	0	0
NS-8 (Establish a No-Growth Program)	0	0	0	0	0	0	0
			Structural (S)				
S-1 (Revetment)	0	P	P	0	0	0	0
S-5 (Beach fill with periodic nourishment stabilized with groins)	F	F	P	P	P	P	P

1/ Local Planning Objectives

RB - Provides recreation beach
FP - Protects against flooding and wave damage
EC - Provides beach erosion control
TBE - Supports tourist-based economy

2/ Other Objectives

NED - National Economic Development
OSE - Other Social Effects
RD - Regional Development

3/ Extent Objectives Met

F - Fully meets objectives
P - Partially meets objectives
0 - Does not meet objectives

2.03.07 Comparison of NS Plans. The rezoning of beach areas (NS-2) and the establishment of construction setback lines (NS-4) would have similar results. Structures built after implementation of either one would be less vulnerable to storm and flood damage than existing structures that are too close to the shoreline. The modification of building codes (NS-3) would reduce the storm damage vulnerability for all new and some existing structures. The availability of Federally guaranteed flood insurance (NS-6) would not reduce the vulnerability of property to storm damage, but it would help to repair or replace flood damaged property. Evacuation planning (NS-7) would provide protection for people but not for property. None of the NS plans would address the beach erosion problem.

2.04 Structural(S) Plans Considered in Detail.

2.04.01 Beach Fill with Periodic Nourishment from Offshore Borrow Area (S-2). This alternative would provide a wave buffer and a recreational beach. All of the subject beaches would be initially filled, if required, to a design height of 6 feet above mean low water. Periodic nourishment would occur at 5-year intervals or as required. Plan S-2 would effectively address the situation found on the western shorelines of Mullet Key, Honeymoon Island, Clearwater Beach Island, and Caladesi Island, Sand Key, Long Key, and Treasure Island. These shorelines would be restored to a desirable shape and width as needed. The S-2 beach nourishment plan would be sufficient to maintain the desired physical and visual conditions.

2.05 Fill Material Source. A 2.6-nautical-mile-long (east to west) shoal (primary source shoal) beginning approximately 1.2 nautical miles west of Mullet Key, Pinellas County and located immediately north of Egmont Channel would be utilized to provide up to 30,000,000 cubic yards of sand for the initial beach fills. A 2.2-nautical-mile-long (north to south) shoal located approximately 1.2 nautical miles west of Cabbage Key, Pinellas County, would be the secondary beach fill source. These shoals would be hydraulically dredged no deeper than the surrounding Gulf bottom. Additional shoals are located in Johns Pass, south of Sand Key; Clearwater Pass, north of Sand Key; and Hurricane Pass, north of Caladesi Island (See Figure 1-1). Detailed drawings of these shoals are located in Appendix C of the Main Report, and the selected borrow areas at Johns Pass and Shoal No. 1 are discussed in Appendix A of the Sand Key General Design Memorandum.

2.05.01 Fill Material Sources Comparison. Shoal No. 1 is farther away from the discharge areas than Shoal No. 2, it contains clean, shelly-sand, it is greater than 20 feet in depth, and it would provide at least 30 million cubic yards of fill material. Shoal No. 2 is approximately 10 feet in depth and would provide approximately 8 million cubic yards of usable sand. Two passes (Hurricane and Clearwater) could provide approximately 300,000 cubic yards of usable sand each. Hurricane Pass is currently being considered for a Federal navigation project; however, a sufficient volume (approximately 100,000 cubic yards) of material could be obtained from the gulf side of Hurricane Pass without the navigation project. Significant volumes of material for the required restoration and nourishment fills are available from shoal areas offshore of Johns Pass.

2.06 Alternative Plans Considered. Each of the considered alternatives was tested for compatibility with the commmon and unique characteristics and needs of each of the 7 shorelines. The comparative impacts of the detailed alternatives are displayed in Table 2-2. Plan S-2 would provide effective erosion control at an acceptable cost for Honeymoon Island, Mullet Key, Clearwater Beach Island, Sand Key, Caladesi Island, Treasure Island, and Long Key. The beach fill alternative plan S-2 was selected. This plan would meet the following planning objectives: provide efficient and economical shoreline erosion control, restoration and maintenance of the esthetic and recreational appeal of shorelines, and provide some protection for shoreline properties from coastal storms. The plan also would support national economic development and significantly contribute to the preservation of cultural and natural resources.

2.07 Application of Selected Plan.

2.07.01 Honeymoon Island. Plan S-2. Initial restoration along 4,500 feet of shoreline would require the discharge of 100,000 cubic yards of material hydraulically dredged from Hurricane Pass. The shoals offshore of this pass would provide an annual average of 15,000 cubic yards of beach nourishment material to be discharged every 5 years or as needed.

2.07.02 Caladesi Island. Plan S-2. An average of 50,000 cubic yards of material from Hurricane Pass would be discharged every 5 years or as needed for beach nourishment.

2.07.03 Clearwater Beach Island. Plan S-2. Five thousand feet of the western shoreline would be restored with 100,000 cubic yards of material dredged from shoal number one or from Clearwater Pass. Shoals located offshore of Clearwater Pass would provide an annual average of 10,000 cubic yards of beach nourishment material to be discharged every 5 years or as needed for the life of the project.

2.07.04 Sand Key. Plan S-2. Approximately 7.3 miles of shoreline would be restored with approximately 2,675,000 cubic yards of material from the offshore borrow areas at the entrance channel to Johns Pass and Shoal No. 1. Nourishment fills of about 300,000 cubic yards of material would be required at about 5-year intervals for the life of the project.

2.07.05 Treasure Island. Plan S-2. An average of 250,000 cubic yards of material from shoal No. 1 or Blind Pass would be discharged every 5 years or as needed to nourish the shoreline.

2.07.06 Long Key. Plan S-2. Advance nourishment of 2,500 feet of shoreline would require 150,000 cubic yards of material from shoal No. 1 or from Blind Pass. An average of 250,000 cubic yards of material from Blind Pass or from shoal No. 1 would be discharged every 5 years or as needed to nourish the beach.

TABLE 2-2

COMPARATIVE IMPACT OF ALTERNATIVES FOR PINELLAS COUNTY

FLORIDA GULF COAST ISLANDS BEACH EROSION CONTROL PROJECT

Alternative	Endangered and Threatened Species	Pinellas County Shoreline	Water Quality	Archeological and Cultural Resources	Economy
Base Condition (No Action)	Continued loss of potential sea turtle nesting beach	Continued erosion	No impact	No impact	Potential property damage and continued loss of tourist attraction characteristics
Non-Structural NS-12	Continued loss of potential sea turtle nesting beach	Continued erosion	No impact	No impact	Potential property damage and continued loss of tourist attraction characteristics
Beach Fill: S-2 (Selected Plan)	Restoration of potential sea turtle nesting beach.	Restored and maintained beach and increased recreational use.	Short-term increase in turbidity at borrow site and along project shoreline. Short-term turbidity at breakwater construction site.	No known potential impact	Reduced potential for property damage and enhanced tourist and retiree attraction characteristics

2.07.07 Mullet Key. Plan S-2. An average of 150,000 cubic yards of material from Shoal No. 1 would be discharged along 6,700 feet of Mullet Key's shoreline every 5 to 6 years as beach nourishment.

2.08 National Economic Development (NED) Plan. The selected plan has the best potential for providing the desired economic benefits because it would provide and maintain those physical and esthetic features deemed necessary for attracting retirees and tourists to this particular region. It would also maintain some protection for private, public, and commercial property against the region's natural forces.

2.09 Comparative Impacts of Alternatives. The alternatives studied in detail, their probable impacts on significant resources, and their economic characteristics are depicted in table 2-2.

2.10 Implementation Responsibilities. Prior to construction, the local sponsor is required to provide assurance that certain actions will be performed. See paragraph 202 of the Main Report for a detailed description of these actions.

3.00 Affected Environment. This section describes the environmental components of the study area that would affect, or be affected by, any of the considered alternatives. Subsection 3.01 describes the major characteristics of the area's natural and human resources to provide an understanding of the environmental conditions. Subsections 3.02, 3.03, 3.04, and 3.05 address the area's significant resources. Subsection 3.06 addresses the borrow areas selected to support the selected plan. Subsection 3.07 addresses environmental changes that would be expected if the selected plan is used. See figures 1-1, 1-2, and 1-3 to locate areas described in this section.

3.01 Pinellas County Shoreline (Affected). The study area is the Gulf of Mexico coastline of Pinellas County, Florida. With Pasco County to the north and Manatee County to the south, the shoreline of Pinellas County is about 87 statute miles long. Pinellas County has a subtropical climate. The average annual rainfall is 53 inches, and the ambient temperature ranges from an average of 64° F in January to an average of 82° F in August. Damaging storms with winds up to hurricane force occur during fall, winter, and spring. The mainland is roughly paralleled by seven elongate (2.6 to 14.2 miles in length and 2,000 feet in width) and low profile (5 to 10 feet above mean low water) islands. The western shorelines of these islands are all sandy beaches with various shapes, widths, and lengths. The islands are connected to the mainland and/or each other by bridge or causeway. The major natural resource on the islands is their beaches. The beaches and their associated shallow underwater bottoms provide habitat for benthic organisms and typical intertidal beach animals such as sand dollars, sea urchins, scallops, mollusks, crabs, shrimp, wedge shells, polychaete (multisegmented) worms, sand bugs, amphipods, and isopods. These beaches are considered to be a significant economic resource by the local sponsor.

There are no significant fishery resources that would be affected by any of the considered alternatives. The beaches provide feeding areas for aquatic animals and birds and provide potential places for sea turtles to make their nests. The beaches of these seven shorelines are being eroded at varying rates by winds, waves, and currents. From north to south these shorelines have the characteristics described below.

a. Honeymoon Island is 2.6 miles long and is low and flat. It is located north of Caladesi Island with Hurricane Pass in between. A hurricane cut one island into these two islands in 1921. This island is vegetated by grasses, herbs, and shrubs with scrub and stands of Australian pine. The State is developing this island as a State Park, and it is accessible by a causeway and bridge combination from the mainland. Rodents, small reptiles, and a large variety of songbirds, shore birds, and wading birds inhabit or frequent the island. The southern half of this island's shoreline is being eroded at an approximate annual rate of 15,000 cubic yards.

b. Caladesi Island is 2.9 miles long and is low and flat. It is located south of Honeymoon Island with Hurricane Pass in between. This island is vegetated by grasses, herbs, and shrubs with scrub and stands of Australian pine. The western shoreline is being eroded at the rate of about 10,000 cubic yards annually. The State is developing this island as a State Park, and it is accessible only by boat. Rodents, small reptiles, and a large variety of songbirds, shore birds, and wading birds inhabit or frequent the island.

c. Clearwater Beach Island is 3.1 miles long, averages 1,200 feet in width, and is less than 10 feet mean low water in height. It is located south of Caladesi Island with Dunedin Pass in between. This island's surface is developed to the extent that little or no natural habitat remains except for the beach areas. The island's city is performing periodic nourishment fills along the southern half of the shoreline. The northern shoreline is losing about 10,000 cubic yards each year to erosion, but there is no authorized project to control this erosion. Access to this island is by causeways and bridges from Sand Key to the south and from the mainland.

d. Sand Key is a narrow, low, and arc-shaped island about 14.2 miles long. Its width varies from 200 to 2,000 feet. The island is located south of Clearwater Beach Island with Clearwater Pass in between. This island's surface is developed to the extent that little or no natural habitat remains except for the beach areas. The city of Clearwater is performing periodic nourishment fills in the area south of the Clearwater Pass groin. The remainder of the island's western shoreline is eroding at different rates along its 7.2-mile length. Access to this island is by numerous bridges from Clearwater Beach Island to the north, from Treasure Island to the south, and from the mainland. Approximately 80,000 cubic yards of beach material are lost each year to erosion.

e. Treasure Island is about 3.5 miles long, it averages 1,500 feet in width, and it is 8 feet mean sea level in height. This island's surface is developed to the extent that little or no natural habitat remains except for the beach areas. Access to this island is by bridges from the islands to the north and south (Sand Key and Long Key, respectively) and from the mainland. The southern 4,200 feet of its shoreline loses about 50,000 cubic yards of beach material each year to erosion. The existing groin was lengthened by 160 feet in 1983 to reduce the rapid rate of erosion.

f. Long Key is about 4.1 miles long, it is very narrow, and its height varies from 5 to 10 feet mean sea level. It is located south of Treasure Island with Blind Pass between. Access is by two bridges from the mainland and one from Treasure Island. This island's surface is developed to the extent that little or no natural habitat remains except for the beach areas. The western shoreline of Long Key is eroding at the rate of about 70,000 cubic yards per year.

g. Mullet Key is roughly "V" shaped, and it is almost 2.3 miles long on its north-south leg (project shoreline) and about 3 miles long on its northeast-southwest leg (see Figure 1-4). It is located south of Cabbage Key, and it is connected by one bridge through Cabbage Key to a bridge between Long Key and the mainland. The island's height varies from 5 to 10 feet above mean sea level, and it is developed as a county park and recreation area. The undisturbed areas are vegetated with trees, shrubs, and grasses. The southern end of the island is protected by a revetment, and there is a groin on the western side of the southern end of the island that collects sand being transported from the north. Approximately 30,000 cubic yards of beach material is eroded away each year from the island's Gulf and Bay shoreline.

3.02 Economy (Affected). The major economic activities on the developed islands are tourism, recreation, retiree housing, offshore commercial fishing, light manufacturing, and agriculture.

3.03 Archeological and Cultural Resources (Affected). The Florida State Historical Preservation Office (SHPO) reviewed the Florida Master Site File and found that only Mullet Key has any archeological or historical sites (an old military ruins at its southern end) that are listed in the National Register of Historic Places. The ruins (Fort DeSoto) will be protected by this project, and the SHPO supports this protection.

3.04 Endangered and Threatened Species (Affected). Coordination with the U.S. National Marine Fisheries Service and the U.S. Fish and Wildlife Service revealed that the following threatened and endangered species inhabit or frequent the study area: Florida manatee, four species of sea turtle (Loggerhead, Leatherback, Hawksbill, and Kemp's Ridley), and six species of whale (Right, Blue, Sei, Fin, Humpback, and Sperm).

3.05 Water Quality (Affected). The waters in the study area are used for swimming, fishing, boating, and other recreational uses. The State of Florida lists the area's waters as being Class III quality (suitable for recreation and the propagation of fish and wildlife).

3.06 Fill Material Sources (Affected). Detailed drawings of Shoals No. 1 and 2 and the four passes (Hurricane Pass, Clearwater Pass, Johns Pass, and Blind Pass) selected to provide fills and the comparisons of the dredged material to the material at the discharge sites are located in Appendix C of the Main Report. Shoals No. 1 and 2 are believed to be supporting organisms similar to the benthic organisms found offshore along the study area (see subsection 3.01 above) because of the proximity of these areas (GDDM, 1982); however, because of constant changes caused by the currents, these shoals are not assumed to support a significant population of benthic organisms. The material at the mouth of Blind Pass was analyzed and found to contain a very low silt-clay fraction and to be predominantly sand and shell (GDDM, 1982). Both of the selected shoals are expected to have a similar composition; however, further analysis of these shoals would be performed prior to beginning dredging operations to determine the extent of compatibility with the discharge areas.

3.07 Environmental Alterations. No environmental feature would be created. The remaining proposed work constitutes replacement and maintenance of previously existing physical features (beaches). See Section 4.00 for a detailed description of the environmental consequences to be expected as a result of the Selected Plan.

4.00 Environmental Effects. This section provides a basis for the comparison of the considered alternatives. The effects of applying each alternative in terms of production, costs, and environmental changes are described.

4.01 Relationship of Plans to Environmental Protection Statutes and the Florida Coastal Zone Management Plan (CZMP). Table 4-1 shows the relationship of plans to the applicable environmental protection statutes and to the State CZMP. The effect of this proposal on the coastal zone would be to enhance the zone's appearance and suitability for beach-type recreation and to restore some of the coastal zone's ability to provide protection against storms and flooding. No lasting adverse effect on water quality would be expected. The proposal, therefore, is consistent with the State CZMP Chapter 161 (Coastal Construction).

4.01.01 One Coastal Barrier Resources System (CBRS) unit (designated P-24A) covers Dunedin Pass to include the northern tip of Clearwater Beach Island and the southern tip of Caladesi Island. The selected plan would restore and periodically renourish the western shoreline beach of Clearwater Beach Island, but the plan would not support any work closer to the CBRS unit than a point 3,500 feet to the south of the unit. The selected plan would periodically nourish the western shoreline beach of Caladesi Island, but the plan would not support any work closer to the CBRS unit than a point

TABLE 4-1

RELATIONSHIP OF PLANS TO ENVIRONMENTAL PROTECTION STATUTES AND OTHER ENVIRONMENTAL REQUIREMENTS
PINELLAS COUNTY BEACH EROSION CONTROL STUDY, PINELLAS COUNTY, FLORIDA, 1983

	Beach Fill Periodic Nourishment	Beach Fill Stabilized With Breakwaters
Federal Statutes		
Archeological and Historic Preservation Act, as amended, 16 U.S.C. 469, et seq.	All plans in full compliance (APIFC)	
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	APIFC	
Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq.	APIFC 1/	
Coastal Zone Management Act, as amended, 16 U.S.C. 1451, et seq.	APIFC	
Endangered Species Act, as amended, 16 U.S.C. 1531, et seq.	APIFC	
Estuary Protection Act, 16 U.S.C. 1221, et seq.	APIFC	
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12), et. seq.	APIFC	
Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661, et seq.	APIFC	
Land and Water Conservation Fund Act, as amended, 16 U.S.C. 460l-460l-11, et seq.	N/A	
Marine Protection, Research and Sanctuaries Act, 33 U.S.C. 1401, et seq.	APIFC	
ational Environmental Policy Act, as amended, 42 U.S.C. 4321, et seq.	APIFC	
River and Harbor Act, 33 U.S.C. 401, et seq.	N/A	
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq	N/A	
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq.	N/A	
Coastal Barrier Resources Act of 1982	APIFC 2/	
Executive Orders		
Floodplain Management (E.O. 11988)	APIFC	
Protection of Wetlands (E.O. 11990)	APIFC	
State Policies		
Florida Coastal Zone Management Plan	APIFC 3/	

NOTES: For each item listed enter one of the following:

a. Full Compliance. Having met all requirements of the statute, E.O., or other environmental requirements for the current stage of planning (either preauthorization or postauthorization).

b. Partial Compliance. Not having met some of the requirements that normally are met in the current stage of planning. Partial compliance entries should be explained in appropriate places in the report and/or EIS and referenced in the table.

c. Non-Compliance. Violation of a requirement of the Statute, E.O., or other environmental requirement. Non-compliance entries should be explained in appropriate places in the report and/or EIS and referenced in the table.

d. Not Applicable. No requirements for the Statute, E.O., or other environmental requirement for the current stage of planning.

1 Exempt from the water quality certification requirements of Section 404(r), and a Section 404(b)(1) evaluation of the selected plan is found in appendix A of this EIS.

2 No new Federal expenditures or financial assistance would be made available within the units of the Coastal Barrier Resources System since there are no authorized exceptions involved.

3 All plans are in compliance with the following chapters. Chapter: 161, coastal construction; 253, sale and fill; 258 and 260, Outdoor Recreation and Conservation; 267, Historic Preservation; 288, Economic Development; 370, Living Resources; 377, Water; 380, Regional Impacts; and 403, Pollution.

1,500 feet to the north. A second CBRS unit (P-24) is located in the area between Long Key and Mullet Key; however, the selected plan would not support any work in the immediate vicinity of this unit. Since CBRA consultation is required only when a Federal agency proposes to make Federal expenditures or financial assistance available within a CBR system unit as authorized by Section 6 of the CBRA (Exceptions), CBRS consultation for this study's selected plan would not be required. In view of the above, all plans are in full compliance with the CBRA. Informal coordination with the U.S. Fish and Wildlife Service has confirmed this conclusion.

4.01.02 The effects of the discharge of dredged material are addressed in paragraph 4.04 and in the 404(b) Evaluation (Attachment A), and this document will be submitted to Congress for project approval and funding. This proposal, therfore, is exempt from the water quality certification requirements of Section 404(r) of the Clean Water Act.

4.02 Endangered and Threatened Species (Effects on). Coordination with the U.S. National Marine Fisheries Service revealed no significant concerns. Coordination with the U.S. Fish and Wildlife Service revealed the need to plan for the protection of two threatened and endangered species in the study area.

4.02.01 Manatees. The no-action plan and the considered nonstructural plan would not involve any activity in the area's waters; therefore, these plans would not have the potential for affecting manatees. The considered structural plan has the potential for causing injuries to manatees during vessel movement and fill material discharge activities. Precautionary measures would be implemented to prevent boat collision and propeller laceration injuries to manatees. These measures would cause production slow-downs that would increase project cost. Any Federal Project contract let for this proposal would include the following two paragraphs.

"The Contractor will instruct all personnel associated with the construction of the project about the presence of manatees in the area and the need to avoid collisions with manatees. All vessels associated with the project shall operate at "no wake" speeds at all times while in shallow waters or channels where the draft of the boat provides less than 3 feet clearance of the bottom. Vessels transporting personnel between the landing and the dredge shall follow routes of deep water to the extent possible. All personnel should be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act of 1973, as amended; the Marine Mammal Protection Act of 1972, and Section 370.12, Florida Statutes. The Contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of the construction of the project.

"The Contractor shall keep a log detailing all sightings, collisions, damage, or killing of manatees which have occurred during the contract period. Any collision with a manatee resulting in death or injury to the animal shall be reported immediately to the Chief, Environment and Resources Branch (Jacksonville District), and the U.S. Fish and Wildlife Service (Jacksonville Area Office). Following project completion a report summarizing the above incidents shall be submitted to the Chief, Environment and Resources Branch."

4.02.02 Sea Turtles. The no-action plan and the considered nonstructural plan would allow the area's natural forces to continue to erode away the beaches used for nesting. The dredging portion of the considered structural plan is unlikely to endanger sea turtles since this work would occur in the open sea or in fast-water passes. The filling portion of this plan could disrupt the annual nesting process of 20 to 30 loggerhead sea turtles that use the Pinellas County shores for nesting (Wesley, 1983). Restoration and periodic nourishment filling, if performed from April to September, could cover up nests and interfere with or prevent the natural hatching process. The preventive measures described below would not significantly affect the project's production schedule but would increase the cost of the project.

The Fish and Wildlife Service has issued a permit to the Florida Department of Natural Resources to take, for scientific purposes and for enhancement of propagation and survival, four species of sea turtle. The Florida Department of Natural Resources controls sea turtle egg recovery operations by specifying the qualifications of the recovery personnel and the procedures they are to use. Any Pinellas County Beach Erosion Control Federal Project dredge and fill contract will be specially conditioned by the Corps of Engineers to hold the contractor responsible for daily dawn patrols of the entire beach work area for the purpose of locating, taking, and incubating turtle eggs and for the release of turtle hatchlings in accordance with the conditions of a FDNR permit. If work is scheduled from April to September, the contractor will be required to begin the turtle egg recovery work 60 days before beginning work or moving equipment onto the beach.

4.03 Pinellas County Shoreline (Effects on). The no-action plan and the considered nonstructural plan would allow the continued loss of valuable recreational, protective, and esthetically appealing beach areas. The considered structural plan would restore the eroded beaches where needed and maintain the restored and/or existing beaches at an acceptable cost. Cost analysis and comparison for the considered alternatives are given in the Main Report. The selected plan would increase and maintain the area's appeal to tourists and retirees.

4.04 Water Quality (Effects on). The no-action plan and the considered nonstructural plan would not affect the area's current water quality since these plans do not involve activities in the area's waters. These plans do not appear to be capable of affecting any ongoing or anticipated water quality changes. The considered structural plan would cause temporary increases in turbidity at the dredging and discharge sites. A lowered dissolved oxygen condition would accompany the turbidity, but it, too, would be short term. These temporary conditions would not significantly affect the area's water quality, nor would these temporary conditions increase the cost or hamper the selected plan's progress.

4.05 Economy (Effects on). See the Main Report and Appendix D.

4.05.01 No-Action. This plan would allow the beach erosion to continue. This would cause a decrease in the number of people attracted to the area, and this situation would lead to a corresponding deterioration in the local economy. No action or funding would be required.

4.05.02 Non-Structural Combination Plan NS-10.

4.05.02.01 Rezoning of Beach Areas. The rezoning of areas subject to erosion and storm damage to prevent future private and commerical construction in those areas would support the area's economy by preventing property losses. No Federal action or funding would be required.

4.05.02.02 Modification of Building Codes. Structures built or modified according to the code would sustain less storm damage than those existing structures that are inadequately designed. This would support the area's economy by decreasing future property losses. No Federal action or funding would be required.

4.05.02.03 Construction Control Line. This plan would have the same effect on the area's economics as Plan NS-2. No Federal action or funding would be required.

4.05.02.04 Flood Insurance. Individuals or commercial organizations that lose property by flooding would be reimbursed to some extent. This plan would support the area's economy by facilitating the replacement of lost or damaged property.

4.05.02.05 Evacuation Planning. This plan would provide warnings of approaching storms and would provide prearranged escape routes for people on the islands and peninsulas. There would be no significant effect on the economy. No Federal action or funding would be required.

4.05.03 Structural Plans (S-2). The use of this plan would restore and/or periodically maintain the subject beaches. This would enhance and maintain, at an acceptable cost, those characteristics of a shoreline that attract tourists and retirees. The presence of substantial numbers of tourists and retirees in the area would promote economic growth in the region.

4.06 Archeological and Cultural Resources (Effects on). The State Historical Preservation Office stated that no effect on any sites listed or eligible for listing could be expected by the implementation of any proposal selected by this study.

4.07 Fill Material Sources (Effects On).

4.07.01 No-Action. This plan would not affect any of the selected fill material sources.

4.07.02 The considered nonstructural plan would not affect any of the selected fill material sources.

4.07.03 Beach Fill Plan S-2. The use of this plan would only affect the two selected offshore shoals. The four selected passes Hurricane Pass, Clearwater Pass, Johns Pass, and Blind Pass would be dredged with the dredged material coming from shoals offshore of the passes. The two offshore shoals would be dredged no deeper than the surrounding contours; therefore, an adverse effect on water quality, as is sometimes experienced with bottom dredging where a pit is formed, and a loss of area-type habitat is not expected. These shoals are not presumed to support a significant population of benthic organisms (subject to analysis prior to dredging operations), and no water quality degrading pits would be formed at the shoal sites. The turbidity caused by hydraulic dredging is not expected to be severe enough or to last long enough to cause any significant environmental damage.

4.08 Cumulative Impacts. Private property owners and the local municipalities have constructed seawalls and groins and placed small amounts of fill material along the study area's coast line. These coast line protection activities increased dramatically following the 1950 hurricane. Seawalls and groins were built along the frontage of Clearwater Beach, the north end of Sand Key, Indian Rocks Beach, Madeira Beach, Treasure Island, and Long Key; however, the storms, waves, and currents continued to damage property and erode beaches in the study area. Except for temporary turbidity caused by dredging and beach fills, there has been no significant effect on the environment in the study area by the rebuilding activities.
The selected plan would incorporate up-to-date environmental protection measures. The selected plan also incorporates some of the activities (periodic beach nourishment fills) that may be reasonably assumed to be required, as a result of the area's natural forces. The predicted cumulative effect of the perpetuation of this coastline erosion-rebuilding cycle is that no significant adverse effects on the environment will occur.

4.09 Floodplain Management. The floodplain areas of the project islands (floodprone areas) would not be significantly affected by this project, since the project will return the coastline to the way it was relative to the floodplain areas. This project, therefore, is consistent with Executive Order 11988 (Floodplain Management).

5.0 List of Preparers.

Name	Discipline/ Expertise	Expertise	Role in Preparing EIS
J. M. Carlton	Plant ecology	6 years: Coastal vegetation ecology, and restoration; 3 years: EIS studies	Study manager and biological assessment
R. L. Tapp	Fishery biology and zoology	5 1/2 years: Navigable waters and wetlands regulation; 1 year: EIS studies	Study manager

List of Preparers (continued)

Name	Discipline/ Expertise	Expertise	Role in Preparing EIS
G. L. Atmar	Biology	12 years: EQ planning and EIS	Supervisor
D. Schmidt	Civil engineering and water resource planning	6 years: Coastal engineering and planning	Current Study Manager
M. Gerber	Civil engineering and water resource planning	3 years: Water resources planning	Study manager, coastal processes assessment, and damage, cost, benefit estimates
C. Stevens	Civil engineering and water resource planning	7 years: Water resources planning	Study manager, coastal processes assessment, and damage, cost, benefit estimates for Sand Key
M. P. Wren	Technical writing and editing	15 years: Technical writing and editing	Revision and editing
D. S. Rosen	Coastal geology	6 years: Geotechnical studies	Geotechnical material

6.00 Public Involvement Program. This section describes the extent of public involvement in this study. It tells how the study's decision-making process was guided by public views and how the public views were incorporated.

6.01 A public hearing was held in Clearwater, Florida, on 20 March 1978. Among the people attending the meeting were representatives of the Federal, State, County, and City governments, various associations, and private property owners. The overall view expressed at the hearing was that local interests needed and desired beach erosion control measures for the Pinellas County shoreline. A copy of the public hearing transcript is on file in the Jacksonville District Office. A final public meeting was held on 17 May 1984, and further details on this meeting are given in Section 7(c) of the main report.

6.02 A notice of intent to prepare a Draft Environmental Impact Statement (DEIS) for this study was published in the Federal Register on 12 November 1982. Mr. Ralph M. Field, the only respondent to the notice, requested a copy of the DEIS.

6.03 A letter of notice of intent to prepare a DEIS for this study (Scoping Letter) was sent to all interested agencies, organizations, and individuals on 24 November 1982.

6.03.01

a. The U.S. Environmental Protection Agency (EPA) responded with the following recommendations. The use of Federal project maintenance dredging material from the area's passes for beach fills should be considered, the economics of periodic renourishment should be considered, the material to be dredged should be checked for physical characteristics and chemical content; the considered alternative structures should be studied to determine their possible effects on the water regime, current patterns, sedimentation, and/or erosion in the area; and proper biological and hydrological surveys should be performed for any close-to-shore shoal selected as a borrow area.

b. The EPA recommendations were considered with the following results. Two offshore shoals and four passes (Hurricane Pass, Clearwater Pass, Johns Pass, and Blind Pass) were selected for obtaining dredged material, beach renourishment was found to be economically acceptable, the wildlife inhabitants of the proposed work areas were identified and listed in the Affected Environment section of this document, core borings from representative areas (see Appendix C of the Main Report) disclosed no incompatible substances, the proposed structures were examined and no design characteristics that could adversely affect the area's water regime were found; and since no close-to-shore borrow areas other than the pass shoals were selected, the last recommendation does not require a response.

6.03.02

a. Ms. Maria T. Mosley, representing the Committee for Clean Air and Water, Inc., responded by recommending against the use of the Sauerman dredging method for environmental reasons and by expressing reservations about using Clearwater Pass as a material source. Ms. Mosley also recommended that a careful study be made on the placement and effects of groins.

b. Ms. Mosley's concerns were evaluated, and no conflict was found since no groin construction, other than the rehabilitation of an existing groin, is planned; the Sauerman dredging method was deleted; and no probable adverse effects could be identified as a result of using Federal project maintenance dredged material from Clearwater Pass.

6.03.03

a. The U.S. Fish and Wildlife Service (FWS) responded by recommending that an indepth study be performed prior to selecting borrow areas, and that turbidity should be minimized during Sauerman dredging operations along the Sand Key shoreline.

b. The FWS recommendations were considered with the following results. Three of the selected pass shoals already have Federal project restrictions on dredging, and the fourth (Hurricane Pass), if retained, would be similarly regulated; the two offshore borrow areas are located at a relatively long distance from shore; the two offshore borrow areas would be more closely studied prior to initiating dredging operations; and Sauerman dredging was deleted, thereby reducing the probability of creating severe turbidity.

6.04 Statement Recipients.

FEDERAL

U.S. Department of Interior
- Fish and Wildlife Service
- National Park Service
- Geological Survey

U.S. Department of Commerce
- National Marine Fisheries Service

U.S. Department of Health and Human Services
- Centers for Disease Control

U.S. Department of Agriculture
- Soil Conservation Service
- Forest Service

U.S. Department of Transportation
- Coast Guard
- U.S. Federal Highway Administration

U.S. Environmental Protection Agency
U.S. Federal Emergency Management Agency
U.S Federal Energy Administration

STATE

State Planning and Development Clearing House

LOCAL AGENCIES

Tampa Bay Regional Planning Council
Tampa Port Authority
Tampa/Hillsborough County Planning Department
Mansota 88
Manatee County Board of County Commissioners
Pinellas County Board of County Commissioners
Hillsborough County Board of County Commissioners

OTHERS

Mote Marine Laboratory
Florida Audubon Society
Mangrove Systems, Inc.
Hillsborough Environmental Coalition
Conservation Consultants, Inc.
Committee for Clean Air and Water
Issac Walton League
Sierra Club
The Nature Conservancy
Florida Medical Entomology Laboratory

A mailing list of these groups and individuals is being maintained at the District Office (SAJPD-ES) and may be consulted upon request.

7.00 Comments on draft environmental impact statement. This section of the FEIS normally discusses all substantive comments received on the DEIS resulting in major changes in the study's decision factors. Changes of this type would also have been discussed in the appropriate sections of the FEIS. Copies of comments from Federal, State, other agencies, and the general public will be included in the Public Views and Response appendix of the main report in accordance with ER 1105-2-920, appendix B, paragraph 3(b)(1).

7.01 No comments on the DEIS were received that led to major changes in the study's decision factors; however, all comments received were considered and answered.

7.02 Comment. The Department of Health and Human Services (DHHS) asked if any analysis had been performed on the material to be dredged and discharged on the beach. DHHS recommended these analysis be performed to determine if the sediments contain any material that might pose a health hazard.

7.02.01 Response. Paragraph 3.06 of the DEIS and appendix C of the Feasibility Report provide the available data on the composition of the areas being considered as beach nourishment sources. Since these areas are composed predominantly of sand, no sediment analysis is planned.

7.03 Comment. The Office of Environmental Project Review of the U.S. Department of Interior notes that the Fish and Wildlife Service would like their letter reports added to the appendix of this report.

7.03.01 Response. The Corps agrees to this request.

7.04 Comment. The Office of the Governor for the State of Florida forwarded copies of comments of the various State agencies.

a. The Department of Natural Resources (DNR) listed the following concerns.

(1) Beach nourishment activities should be restricted during sea turtle nesting season (May to December), beach monitoring for nests must begin in May; personnel trained in nest translocation must walk the beach planned for nourishment once per day, in early morning, to mark nest sites and subsequently move them to a safe area; and translocation must take place within 48 hours after the nest was laid.

(2) The viable infaunal communities and marine food web in the offshore borrow areas have not been considered.

(3) Every attempt should be made to incorporate native vegetation in beach rebuilding schemes.

(4) Significant circulation pattern alterations might occur, especially in the southern borrow areas, as a result of the proposed shoal dredging. Any circulation changes could impact both biological and physical characteristics of adjacent Gulf and bay areas.

b. The Department of Environmental Regulation (DER) listed the following concerns.

(1) Paragraph 224(d) of the Feasibility Report includes a breakwater for Sand Key, but paragraph 2.07.03 of the DEIS does not mention the breakwater.

(2) Comparative investigations should be made to determine the effectiveness of similar projects and their impacts on near shore fish species and their habitat.

(3) This project should be performed only during the period of December through February to avoid major spawning and migrations of marine life. The bottom habitat at the proposed breakwater sites should be described, and the breakwaters should be located elsewhere if there are extensive live bottoms at the proposed locations.

(4) Vessels involved in the project should have prop guards to further protect manatees from injury.

(5) The benthic species now occupying the beach areas would reestablish themselves only if the discharged material is of the same grain size presently in the fill areas.

(6) The consistency determination for the Florida Coastal Zone Management Program should be more detailed, and it should specifically address how the project is consistent with the rules and regulations.

c. Comment. The Pinellas County Planning Department approved of the planned renourishment activities but advocates dune restoration as a means of deriving more benefits from this project.

7.04.01 Response.

a. DNR.

(1) DER has requested this project's activities only take place during the period of December through February to avoid major spawning and migrations of marine life; therefore, the combination of recommendations from DNR and DER would allow the selected plan to be performed during only 2 months of the year. Since this restriction would not be realistic, these recommendations cannot be included in the selected plan. Subsection 4.02.02 of the DEIS states that the qualifications of sea turtle egg recovery personnel and the procedures they use are specified by DNR; therefore, the turtle egg recovery requirements portion of this comment have already been incorporated into the selected plan.

(2) The infaunal communities and marine food web in the offshore borrow areas have been considered; and as stated in paragraph 4.07.03 of the DEIS, subject to further analysis, no adverse effects on these communities and food webs (if any) are expected.

(3) The use of unspecified native vegetation on beaches could not be considered because of insufficient information and because of its probable unsuitability. The primary purpose of rebuilding and maintaining the subject beaches is to provide a standard scenic view and physical shoreline structure that is suitable for "beach type recreation." If any type of vegetation was to be planted on these beaches, the beaches would lose their appeal for use as a beach recreation area; and if such a beach was used as a recreation area anyway, the vegetation could not be expected to survive. The Corps would have no objection to the authorized planting of sea oats or other suitable vegetation on dune areas landward of rebuilt and/or periodically renourished recreational beach areas.

(4) The possible occurrence of significant changes in circulation patterns in the Gulf of Mexico as a result of dredging relatively small and constantly shifting shoals down to the surrounding bottom's elevation in open water is not perceived as being very likely by the Corps.

b. DER.

(1) Paragraph 2.07.03 of the DEIS has been corrected to include the addition of a breakwater structure offshore of Sand Key.

(2) The Corps cannot add a major study area for Gulf inhabitants that are not considered as significant environmental quality resources in relation to this proposal (near shore fish species) or for their habitat (shallow open water areas).

(3) See subparagraph 7.04.01(a)(1) above. The breakwater would be placed in a littoral zone where strong erosive forces are operating; therefore, very little permanent benthic life could exist. A breakwater structure would provide a much more productive habitat than a relatively small area of sandy bottom under constant erosive influences.

(4) The Corps is unable to require prop guards on contract vessels.

(5) A study performed for the Corps on the long-term effects of beach nourishment on the benthic fauna (Culter and Mahaderan, 1982) found significant statistical opposition to DER's unsubstantiated claim of specificity for benthic species according to benthic grain size. In view of the available evidence, no concern for the present benthic inhabitant's ability to become reestablished is necessary.

(6) The Corps understands an EIS for a project in a State's coastal zone must contain a Coastal Zone Management Consistency Determination (CZMCD). The Corps understands a CZMCD is composed of the following parts:

(a) A detailed description of the activity and its associated facilities.

(b) The effects of the activity and its associated facilities on the coastal zone.

(c) An evaluation of the relevant provisions of the State management program.

(d) Comprehensive data and information sufficient to support the Federal agency's consistency statement.

Requirement a is fulfilled throughout the Feasibility Report and EIS by the descriptions of the alternatives considered and the selected plan. Requirement b is fulfilled by the second and third sentences of paragraph 4.01 of the EIS. Requirement c is fulfilled by footnote 3 of Table 4-1 of the EIS. Requirement d is fulfilled throughout the Feasibility Report and the EIS.

c. Additional consideration was given to dune restoration and related activities, and Section 116 (subparagraphs b(S-7) and b(S-9)) and paragraph 55 of Appendix A of the main report were augmented to include the results of this consideration.

7.05 Comment. The U.S. National Ocean Service (NOS) noted the FDER's finding that the Federal consistency issue was not given enough consideration and will recommend the Corps identify and address the CZM statutes impacting this proposed project.

7.05.01 Response. The response to FDER in Section 7.04.01(b)(6) is also an appropriate response to the NOS comment.

7.06 Comment. The Tampa Bay Regional Planning Council (Council) notes that the DEIS does not clearly identify the historical success rate of offshore breakwaters in reducing sand erosion for the selected plan with regards to the number and location of offshore breakwaters.

7.06.01 Response. The council's observation is correct; however, the EIS does not address the subject of the historical success of breakwater because the required treatment, if any, of this subject would occur as an engineering matter in the main report.

TABLE I-1

INDEX, REFERENCE, AND APPENDIXES
(Pinellas County, Florida Beach Erosion Control)

STUDY DOCUMENTATION

Subject	Environmental Impact Statement	Main Report (References Incorporated)	Report Appendixes (References Incorporated)
Affected Environment	para 3.00	para 36-43	Appendix A
Alternatives	para 2.00		
Application of Selected Plan	para 2.07	para 195	
Archeological and Cultural Resources			
Affected	para 3.06		
Effects on	para 4.06		
Comments on Draft Environmental Impact Statement	para 7.00		
Comparative Impacts of Alternatives	para 2.09	para 172	
Comparison of NS Plans	para 2.03.07	page 48 table 8	
Comparison of Structural Plans	para 2.04.03	page 48 table 8	
Economy			
Affected	para 3.02		
Effects on	para 4.05	para 193	Appendix D

TABLE I-1 (Cont'd)

INDEX, REFERENCE, AND APPENDIXES
(Pinellas County, Florida Beach Erosion Control)

STUDY DOCUMENTATION

Subject	Environmental Impact Statement	Main Report (References Incorporated)	Report Appendixes (References Incorporated)
Endangered and Threatened Species			
Affected	para 3.04	para 40	
Effects on	para 4.02		
Environmental Alterations	para 3.07		
Environmental Effects	para 4.00		
Fill Material Source Plans	para 2.05		Appendix C
Fill Material Sources			
Affected	para 3.06		
Effects on	para 4.07		
Fill Material Sources Comparison	para 2.05.01	para 150-151	Appendix C
Implementation Responsibilities	para 2.01	para 141, 150, 164	
List of Preparers	page EIS-		
National Economic Development (NED) Plan	para 2.08	para 178	

TABLE I-1 (Cont'd)

INDEX, REFERENCE, AND APPENDIXES
(Pinellas County, Florida Beach Erosion Control)

STUDY DOCUMENTATION

Subject	Environmental Impact Statement	Main Report (References Incorporated)	Report Appendixes (References Incorporated)
Need for and Objectives of Action	para 1.00	para 16-18	
No action	para 2.02	para 19-60	Appendix A
Nonstructural and Structural Alternatives Eliminated from Further Study	para 2.01	page 48 table 8 para 116	
Nonstructural (NS) Plans Considered in Detail	para 2.03	para 138-151	Appendix B
Pinellas County Shoreline			
Affected	para 3.01		
Effects on	para 4.03	para 174	
Public Involvement Program	para 6.00	para 6-8	Appendix E
Relationship of Plans to Environmental Protection Statutes and the Florida Coastal Zone Management Plan (CZMP)	para 4.01		
Selected Plan	para 2.06	para 195	
Structural (S) Plans Considered in Detail	para 2.04	para 136	

TABLE I-1 (Cont'd)

INDEX, REFERENCE, AND APPENDIXES
(Pinellas County, Florida Beach Erosion Control)

STUDY DOCUMENTATION

Subject	Environmental Impact Statement	Main Report (References Incorporated)	Report Appendixes (References Incorporated)
Water Quality			
Affected	para 3.05		
Effects on	para 4.04	para 42-43	

REFERENCES

The Endangered Species Act of 1973 as amended December 1978. U.S. Fish and Wildlife Service, U.S. Department of the Interior, Washington, DC.

Wesley, David J., 24 June 1983, letter from the U.S. Fish and Wildlife Service, Jacksonville, Florida, to the U.S. Army Corps of Engineers, Jacksonville, Florida.

General and Detail Design Memorandum Addendum III with Environmental Assessment for the Pinellas County Beach Erosion Control Project, January 1982, Department of the Army, Jacksonville District, Corps of Engineers, Jacksonville, Florida.

Culter, J. K., and Mahadevan, S., "Long-Term Effects of Beach Nourishment on the Benthic Fauna of Panama City Beach, Florida," 1982, Mote Marine Laboratory, Sarasota, Florida.

ATTACHMENTS

A. Section 404(b) Evaluation Report

SECTION 404 EVALUATION REPORT
BEACH EROSION CONTROL PROJECT REVIEW STUDY
FOR PINELLAS COUNTY, FLORIDA

1. Project description.

a. Location. The western shorelines of seven Pinellas County, Florida, barrier islands and keys. The names of the islands and keys are as follows. Honeymooon Island, Clearwater Beach Island, Sand Key, Long Key, Mullet Key, Treasure Island, and Caladesi Island. A project location map is attached.

b. General description.

(1) These islands and keys are elongate, narrow, and roughly parallel to the Pinellas County coastline from north to south. Shoreline erosion and a lowered beach profile caused by storms, wave action, and currents have become a serious concern with the increase in private and commercial development on these islands and keys and with the increased use of the area for recreational purposes. The combination of receding shorelines and decreasing beach profiles increases the vulnerability of people and their property in this area to storm damage. These conditions also reduce the areas' appeal for recreational use. Private property owners and affected municipalities have slowed down but not stopped the erosion on some of the islands and keys by building seawalls and groins and by discharging small amounts of fill material. Previous beach restorations and groin construction dating back to 1969 were performed at Treasure Island and Long Key.

(2) The selected plan involves one or more structural activities at each of the subject islands as described below.

(a) Honeymoon Island: A 4,500-foot segment of shoreline would be restored with 100,000 cubic yards (cy) of dredged material obtained from nearby Hurricane Pass. The shoreline would then be renourished from the same source with an estimated 75,000 cy of material every five years.

(b) Caladesi Island: An initial restoration is not required; however, an estimated 50,000 cy of dredged material from Hurricane Pass would be needed for beach nourishment every five years.

(c) Clearwater Beach Island: A 5,000-foot segment of shoreline would be restored with 100,000 cy of dredged material obtained from nearby Clearwater Pass or from shoal No. 1 (see attached location map). The shoreline would then be renourished from the same sources with an estimated 50,000 cy of material every five years.

(d) Sand Key: A 7.3-mile segment of shoreline would be restored with 2,675,000 cy of dredged material obtained from the offshore borrow area at the entrance channel to Johns Pass and Shoal No. 1. The shoreline would then be renourished with an estimated 300,000 cy of material at approximate 5-year intervals.

(e) Treasure Island: A 4,200-foot segment of shoreline on the southern end of the island would be nourished from nearby Blind Pass or from shoal No. 1 with an estimated 250,000 cy every five years.

(f) Long Key: A 2,500-foot segment of shoreline would be restored with 150,000 cy of dredged material obtained from shoal No. 1 or Blind Pass. The shoreline would be renourished as needed with an estimated 250,000 cy of material from the same sources every five years.

(g) Mullet Key: The shoreline would be renourished with approximately 150,000 cubic yards of dredged material from Shoal No. 1 every 5 years.

(3) All project dredging would be by the hydraulic method, and the amount of material obtained from the area's passes would be limited by the width, depth, and location restrictions of Federal project maintenance dredging.

(4) The dredged material obtained from the offshore shoals (No. 1 and possibly No. 2) would be transported by barge and/or slurry pipe to the fill sites. The material obtained from the pass shoals would be piped hydraulically to the discharge sites.

c. Authority and purpose. The Senate Public Works Committee Resolution of 4 March 1976 and the House Public Works Committee Resolution of 23 September 1976 authorized a review of the beach erosion control project for Pinellas County, Florida (HD 519/89/2). These resolutions are given in section 2 of the main report.

d. General description of dredged or fill material.

(1) General characteristics of material. The two open sea shoals and the shoals in the designated passes that would supply the beach fill material for this project are composed primarily of fine sand and shell fragments.

(2) Quantity of material. The quantities of material that would be discharged into navigable waters of the United States during this project are included with the individual island project descriptions in part 1(b) above.

(3) Source of material. The sources of the dredged material that would be discharged into navigable waters of the United States during this project are described in the individual island project descriptions in part 1(b) above and shown on the attached project location map.

e. Description of the proposed discharge site.

(1) Location. The locations of the proposed discharge sites were described in part 1(b) above and are shown on the attached project location map.

(2) Size. The sizes of the proposed fill sites were described in part 1(b) above. The exact surface areas of the periodic nourishment fills would be unpredictable due to varying rates of annual erosion.

(3) Type of site. The proposed discharge sites are all segments of existing beaches and their associated shallow sandy bottom areas on coastal barrier-islands and peninsulas.

(4) Type of habitat. The fill areas provide habitat for benthic organisms and feeding areas for aquatic animals and birds. The beaches provide potential places for sea turtle nesting. Except for the two northernmost islands, the study area's uplands have all been developed so that no significant wildlife habitat exists. The waters around the subject islands are within the Florida manatee's summer range and near a winter range (Tampa Bay).

(5) Timing and duration of discharge. The initial beach restoration would be performed following allocation of the necessary funds, receipt of the necessary permits, and conclusion of the contract letting process. The Clearwater Beach Island initial restoration date has not yet been determined. The Periodic nourishment is planned for 5-year intervals with a provision for shorter intervals if needed. Work periods for these projects are not yet known.

f. Description of discharge method. The dredged material would be transported by barge and/or slurry pipe to the beach fill sites. The dredged material would be hydraulically pumped onto the shore fill areas.

2. Factual determinations.

a. Physical substrate determinations.

(1) Substrate elevation and slope. The fill sites' elevations range from a few feet above to a few feet below sea level. The slopes of these sites vary from steeply eroded areas to very shallow eroded areas.

(2) Sediment type. Fine sand-shell mixture.

(3) Dredged/fill material movement. The beach nourishment fills of fine sand composition would be eroded away at varying rates and moved varying distances according to the severity of the wave and current action and storms in the area of each fill. Accurate forecasts of fill material movements are not possible due to the variations in intensity and frequency of those sea and weather conditions.

(4) Physical effects on benthos. The existing conditions in the project area amount to a continuous removal of benthic habitat by erosion. Organisms residing in these areas must burrow deeper, relocate, or die for lack of habitat. The proposed restorations and periodic fills would cause organisms residing in these areas to burrow upward, relocate, or die as a result of being covered by the fill material. The overall result of these fills, with respect to benthic organisms, would be to create a requirement for the benthic organisms to adapt to a changing habitat while ensuring that a suitable habitat continues to exist. The subject areas have not been documented as being environmentally sensitive resources; therefore, the adjacent surf and offshore benthic zones are not expected to sustain a significant loss of important aquatic resources as a result of fill and nourishment caused activity.

b. Water circulation, fluctuation, and salinity determination.

(1) Water column effects. Water depths would be increased to elevations no lower than the surrounding sea bed at the open sea borrow shoals and no lower than allowed by the Federal project maintenance dredging restrictions for each of the borrow shoals in the designated passes. Depths would be decreased in the fill areas. Where water columns would be eliminated by fills the losses would be considered acceptable and desirable to meet the purpose and need for the project.

(2) Current patterns and circulation. The project groins are designed and located for the purpose of reducing the eroding effects of prevailing current patterns by deflecting the strength of these currents away from certain shoreline areas. No significant effect on current patterns in the general area is expected.

(3) Normal water level fluctuations and salinity gradients. No significant effect would be anticipated.

c. Suspended particulate/turbidity determinations.

(1) Expected changes in suspended particulates and turbidity levels in the vicinity of the disposal site. The discharged material would be very similar to the receiving substrate; therefore, the area's waters would not realize a significant change in the type of suspended particulates.

Turbidity levels in the immediate discharge areas would be high for a relatively short period of time, and the turbidity levels in adjacent surf and offshore would be low for a relatively short period of time. No significant adverse effects as a result of project caused turbidity would be expected.

(2) Effects on chemical and physical properties of the water column.

(a) Light penetration. Short-term reduction caused by a temporary increase in turbidity caused by filling activities.

(b) Dissolved oxygen. Short-term decrease with the temporary increase in turbidity and a rapid recovery when the turbidity dissipates following the fill activities.

(c) Toxic metals, organics, and pathogens. None identified.

(d) Esthetics. The appearance of the water column would be temporarily degraded by turbidity at the restored and periodic nourishment sites.

(3) Effects on biota.

(a) Primary productivity and photosynthesis. Temporary disruption with rapid recovery following the fill activities.

(b) Suspension/filter feeders. Temporary disruption with rapid recovery following the fill activities.

(c) Sight feeders. Temporary disruption with rapid recovery following the fill activities.

d. Contaminant determinations. None identified.

e. Aquatic ecosystem and organism determinations. The subject beaches and their adjacent shallow, sandy bottoms provide habitat for benthic organisms and feeding areas for aquatic animals and birds. These bottom areas support benthic organisms and typical intertidal beach animals, such as sand dollars, sea urchins, scallops, mollusks, crabs, shrimp, wedge shells, polychaete worms, sand bugs, amphipods, and isopods. There are no significant natural resources that would be adversely affected by this project.

(1) Endangered and threatened species. The west Florida coastal beaches are known to be used by sea turtles for nesting. The dredging portion of this project is unlikely to endanger sea turtles since this work will occur in the open sea or in fast-water passes. The filling portion of these plans could disrupt the annual nesting process of 20 to 30 loggerhead sea turtles that use the Pinellas County shores for nesting. Restoration and periodic nourishment filling, if performed during the period of April to

September, could cover up nests and interfere or prevent the natural hatching process. The Fish and Wildlife Service has issued a permit to the Florida Department of Natural Resources (FDNR) to take, for scientific purposes and for enhancement of propagation and survival, four species of sea turtles. FDNR controls egg recovery operations by specifying the qualifications of the recovery personnel and the procedures they are to use. Any Pinellas County Beach Erosion Control Federal Project dredge and fill contract will be specially conditioned by the Corps of Engineers to hold the contractor responsible for daily dawn patrols of the entire beach work area for the purpose of locating, taking, and incubating turtle eggs and for the release of turtle hatchlings in accordance with the conditions of an FDNR permit. If work is scheduled from April to September, the contractor will be required to begin the turtle egg recovery work 60 days before beginning work or moving equipment onto the beach.

The project area is in the summer range and near a winter range (Tampa Bay) for the Florida manatee; however, the dredging and filling portions of this proposal is unlikely to endanger the manatees. This work will occur in the open sea, on the Gulf side of the islands, or in fast-water passes. Project support shuttle boats operating between the mainland and the work sites would be a potential hazard to manatees in the area. The project contract would be conditioned to require the following actions by the contractor.

"The Contractor will instruct all personnel associated with the construction of the project about the presence of manatees in the area and the need to avoid collisions with manatees. All vessels associated with the project shall operate at 'no wake' speeds at all times while in shallow waters or channels where the draft of the boat provides less than 3 feet clearance of the bottom. Vessels transporting personnel between the landing and the dredge shall follow routes of deep water to the extent possible. All personnel should be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act of 1973, as amended, the Marine Mammal Protection Act of 1972, and Section 370.12, Florida Statutes. The Contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of the construction of the project.

"The Contractor shall keep a log detailing all sightings, collisions, damage, or killing of manatees which have occurred during the contract period. Any collisions with a manatee resulting in death or injury to the animal shall be reported immediately to the Chief, Environment and Resources Branch (Jacksonville District), and the U.S. Fish and Wildlife Service (Jacksonville Area Office). Following project completion a report summarizing the above incidents shall be submitted to the Chief, Environment and Resources Branch."

f. Proposed disposal site determinations.

(1) Mixing zone determination. No contaminants are known to be in the project dredged material that would violate the applicable water quality

standards, and the dredged material is the same or nearly the same type as the fill area substrate material. In view of these conditions, a limited mixing zone in the vicinity of the discharge site is allowed.

(2) Determination of compliance with applicable water quality standards. No conflict with the applicable water quality standards for the discharge of dredged material would be anticipated for the reasons given in paragraph f (1) above.

(3) Potential effects on human use characteristics.

(a) Municipal and private water supplies. None.

(b) Recreational and commercial fisheries. None.

(c) Water related recreation. The desirable characteristics would be improved and maintained.

(d) Esthetics. Improved and maintained.

(e) Parks, national and historic monuments, national seashores, wilderness areas, research sites, and similar preserves. Caladesi Island and Honeymoon Island are being developed by the State of Florida as State Parks. This project will enhance the esthetic and recreational values of these islands. The ruins of a military fort (Fort DeSoto) are located several hundred feet upland of the fill site on Mullet Key. This project will increase the protection for the ruins against erosion provided by the Key's shoreline.

g. Determination of cumulative effects on the aquatic ecosystem. There would be no permanent cumulative effects on the aquatic ecosystem since the fill areas would realize a continuous erosion by sea and weather, and the dredge sites would realize a continuous replenishment by sea and weather.

3. Findings of compliance or non-compliance with the restrictions on discharge.

a. No significant adaptations of the guidelines were made relative to this evaluation.

b. No practicable alternative exists which meets the study objectives that does not involve discharge of fill into waters of the United States.

c. The discharge of fill materials would not cause or contribute to, after consideration of disposal site dilution and dispersion, violations of any applicable State water quality standards for Class III waters. The discharge operation will not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

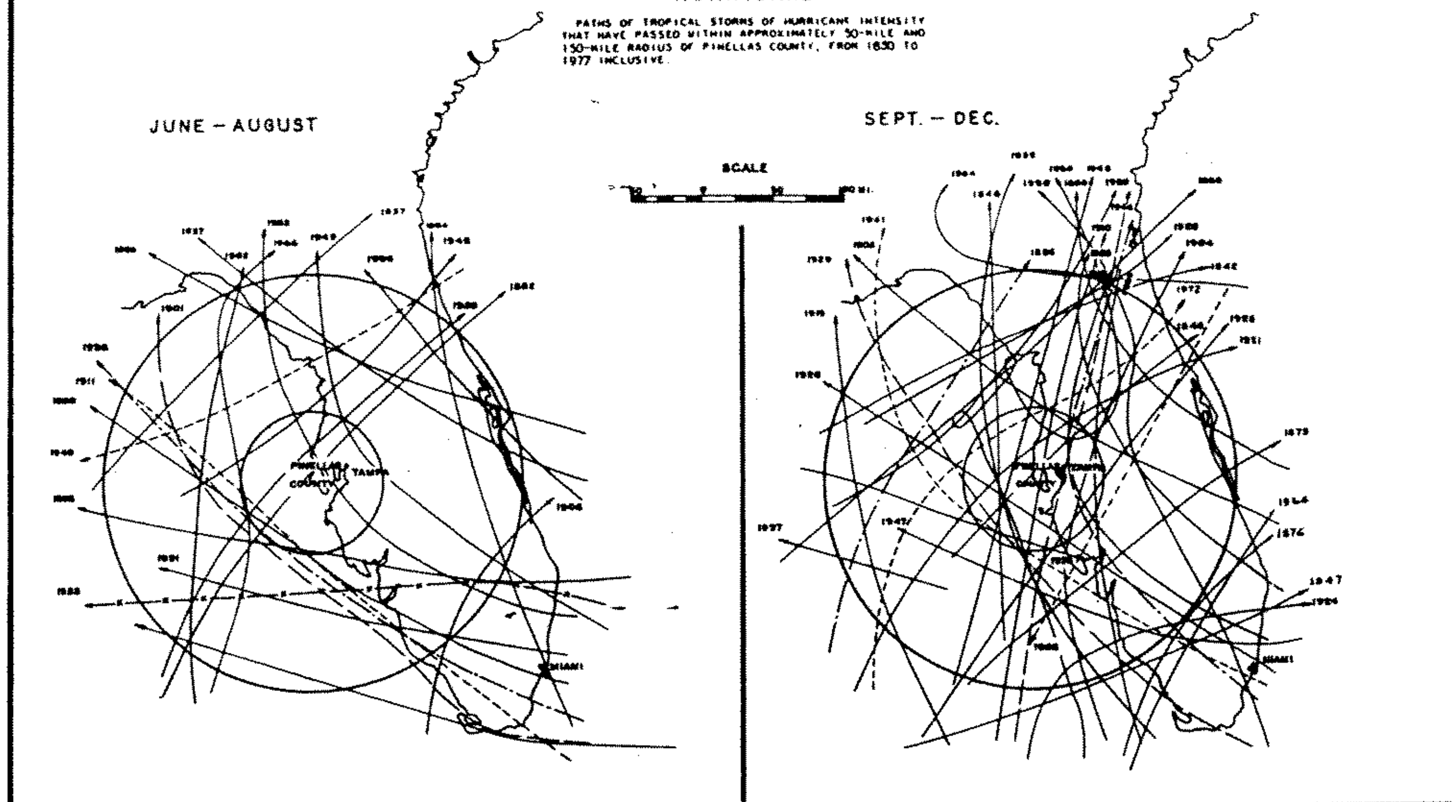
d. The placement of fill material would not jeopardize the continued existence of any species listed as threatened or endangered or result in the likelihood of destruction or adverse modification of any critical habitat as specified by the Endangered Species Act of 1973, as amended.

e. The placement of fill materials would not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreational and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic species and other wildlife would not be adversely affected. Significant adverse effects on aquatic ecosystem diversity; productivity and stability; and recreational, esthetic, and economic values would not occur.

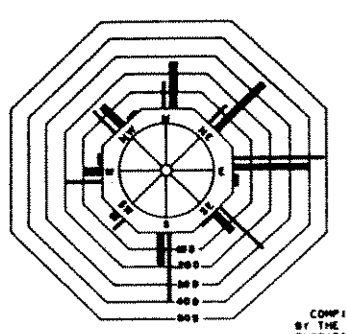
f. On the basis of the guidelines, the proposed fill sites for the discharge of fill materials are specified as complying with the requirements of these guidelines.

HURRICANE

PATHS OF TROPICAL STORMS OF HURRICANE INTENSITY THAT HAVE PASSED WITHIN APPROXIMATELY 50-MILE AND 150-MILE RADIUS OF PINELLAS COUNTY, FROM 1830 TO 1977 INCLUSIVE.



AVERAGE DIRECTION AND VELOCITY OF WINDS FOR ONE YEAR AT TAMPA, FLORIDA.



LEGEND

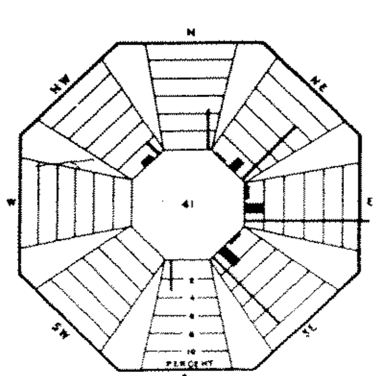
10 M.P.H. OR LESS

10 TO 20 M.P.H.

20 M.P.H. OR MORE

COMPILED FROM DATA FURNISHED BY THE U.S. WEATHER BUREAU, TAMPA, FLORIDA, PERIOD COVERED JANUARY 1, 1930 TO APRIL 20, 1936

SWELL DIAGRAM



IN THE SWELL DIAGRAM THE LENGTH OF THE BAR DENOTES THE PERCENT OF THE TIME THAT SWELLS OF EACH TYPE HAVE BEEN MOVING FROM OR NEAR THE GIVEN DIRECTION THE FIGURE IN CENTER OF THE DIAGRAM INDICATES THE PERCENT OF CALMS.

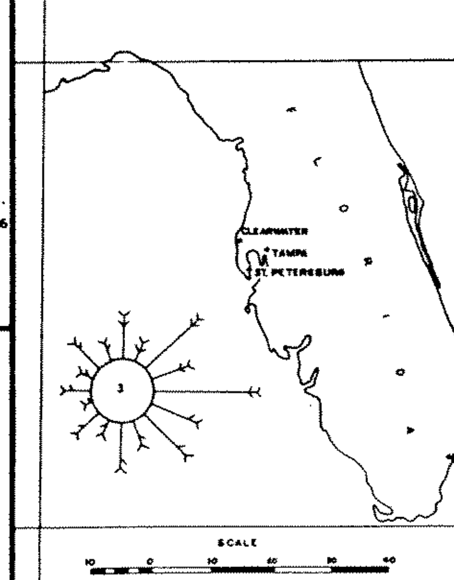
LOW SWELLS (1-6 FEET)

MEDIUM SWELLS (6-12 FEET)

HIGH SWELLS (OVER 12 FEET)

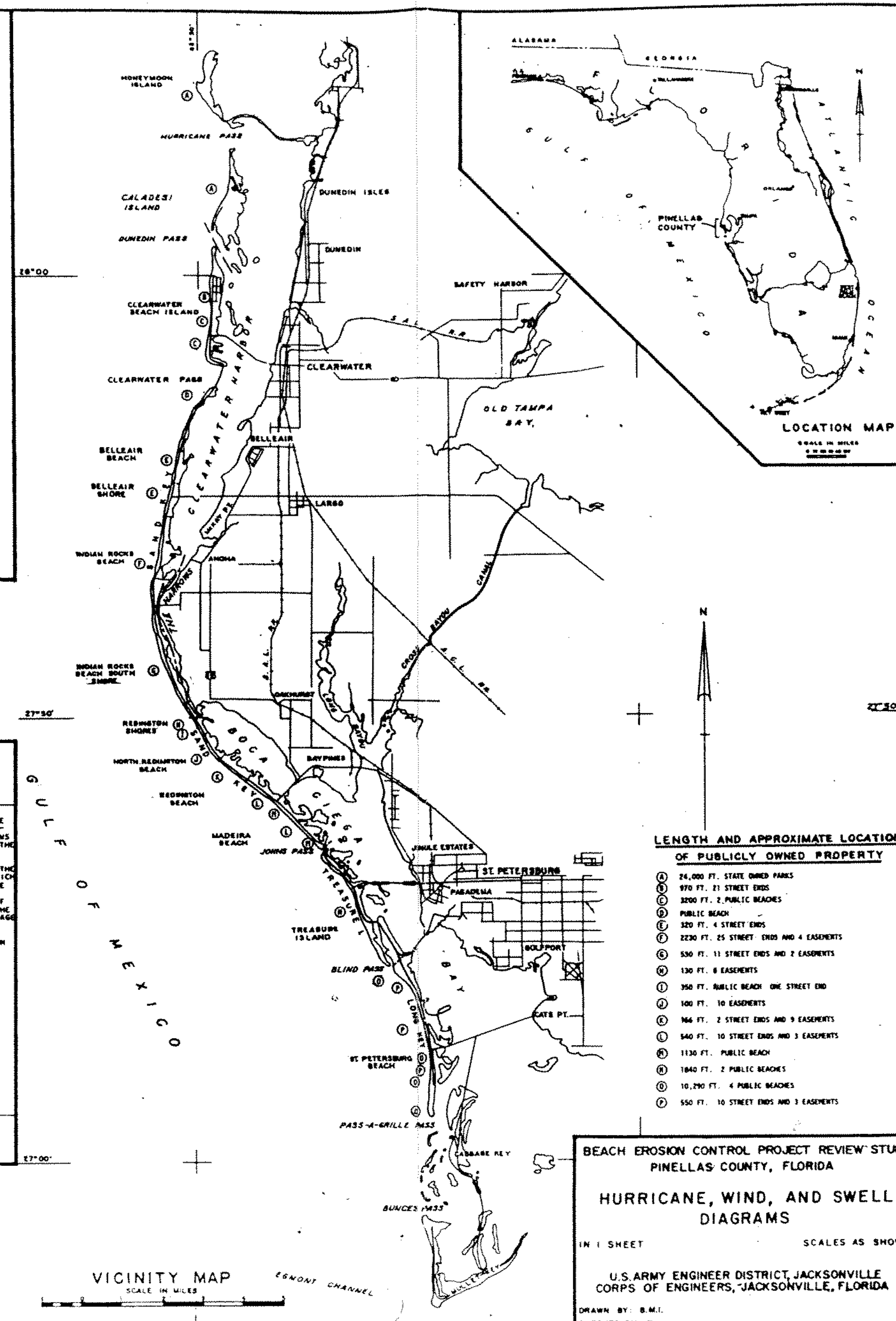
THE SWELL DIAGRAM APPLIES ONLY TO THE GULF OF MEXICO PORTION OF THE 5° SQUARE SHOWN IN PREVAILING WIND DIAGRAM BELOW.

PREVAILING WINDS OFF FLORIDA WEST COAST



THE WIND ROSE SHOWN INDICATES THE YEARLY AVERAGE WINDS THAT HAVE PREVAILED WITHIN THE 5° AREA THE ARROWS FLY WITH THE WIND. THE LENGTH OF THE ARROW MEASURED FROM THE OUTSIDE OF THE CIRCLE AS DEMONSTRATED ON THE SCALE BELOW, GIVES THE PERCENT OF THE TOTAL NUMBER OF OBSERVATIONS IN WHICH THE WIND HAS BLOWN FROM OR NEAR THE GIVEN DIRECTION THE NUMBER OF FEATHERS SHOWS THE AVERAGE FORCE OF THE WIND ON THE BEAUFORT SCALE. THE FIGURE IN CENTER GIVES THE PERCENTAGE OF CALMS.

WIND ROSES FOR 12-MONTH PERIOD ENDING JULY 1946 WERE COMPILED FROM PILOT CHARTS OF THE NORTH ATLANTIC OCEAN ISSUED BY THE HYDROGRAPHIC OFFICE, U.S. NAVY.



BEACH EROSION CONTROL PROJECT REVIEW STUDY
PINELLAS COUNTY, FLORIDA

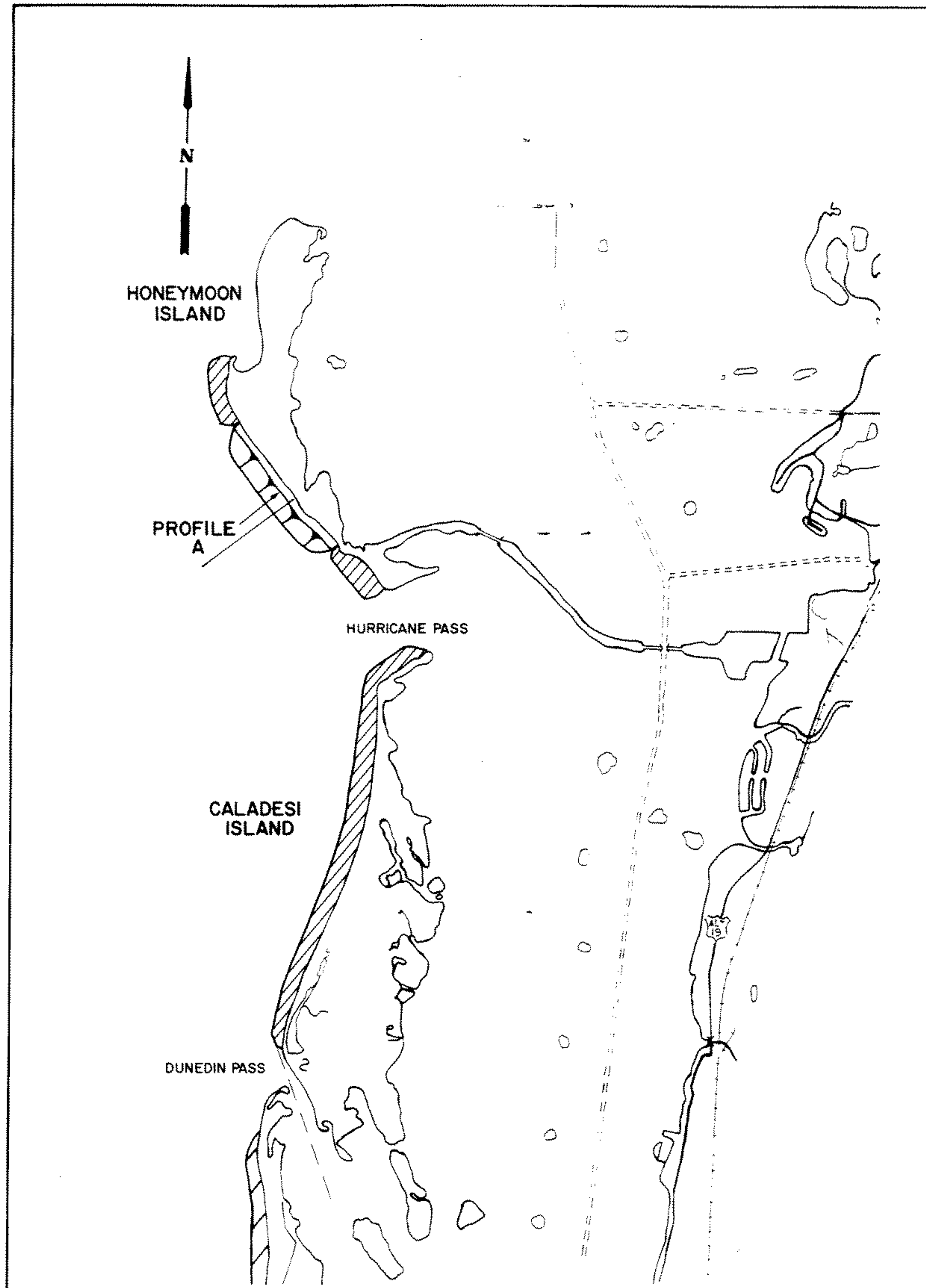
HURRICANE, WIND, AND SWELL DIAGRAMS

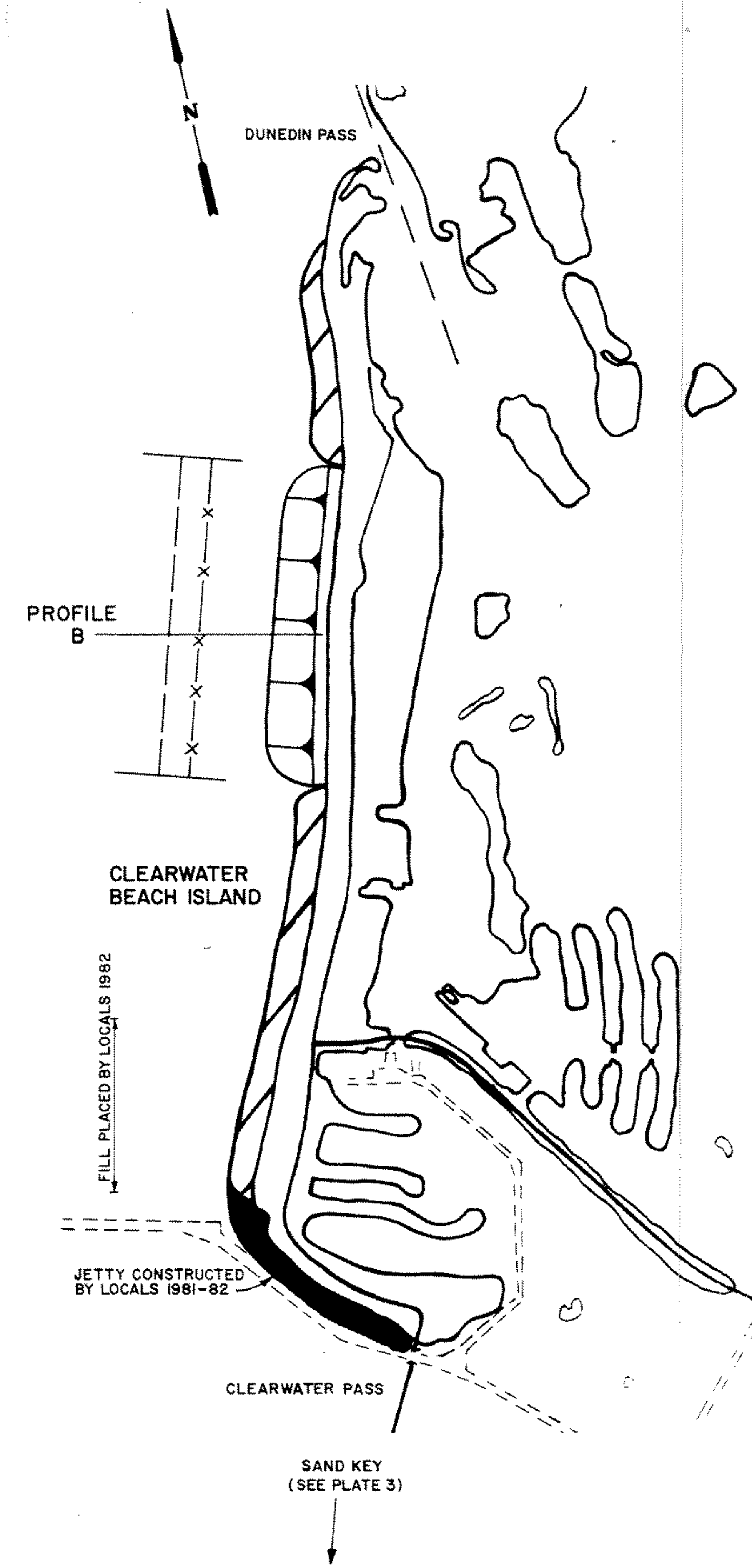
IN 1 SHEET — SCALES AS SHOWN

U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA

DRAWN BY: B.M.I.
CHECKED BY: T.L.L.

DECEMBER 1980





LEGEND

- - - INITIAL RESTORATION AUTHORIZED

—x— PERIODIC NOURISHMENT AUTHORIZED

40' BERM AT +6 ELEV. AT CLEARWATER BEACH

20' BERM AT +6 ELEV. AT HONEYMOON ISLAND

1 VERTICAL TO 20 HORIZONTAL TO MLW

1 VERTICAL TO 30 HORIZONTAL TO EXISTING BOTTOM

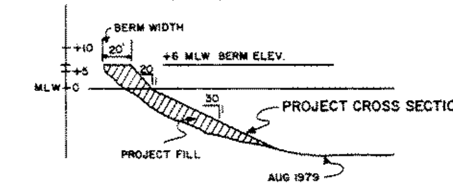
RECOMMENDED PLAN

INITIAL AND PERIODIC NOURISHMENT FOR HONEYMOON ISLAND AND CLEARWATER BEACH ISLAND* IN THE LOCATIONS SHOWN

PERIODIC NOURISHMENT FOR HONEYMOON ISLAND, CALADESI ISLAND AND CLEARWATER BEACH ISLAND * IN THE LOCATIONS SHOWN

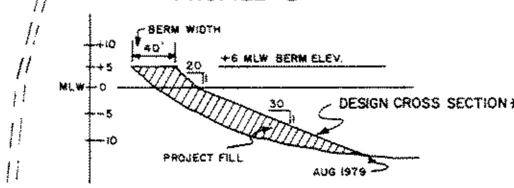
* AS AUTHORIZED THROUGH THE USEFUL LIFE OF THE PROJECT FOR CLEARWATER BEACH ISLAND

PROFILE A



TYPICAL CROSS SECTION

PROFILE B



TYPICAL CROSS SECTION

** AUTHORIZED AND RECOMMENDED CROSS SECTION

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

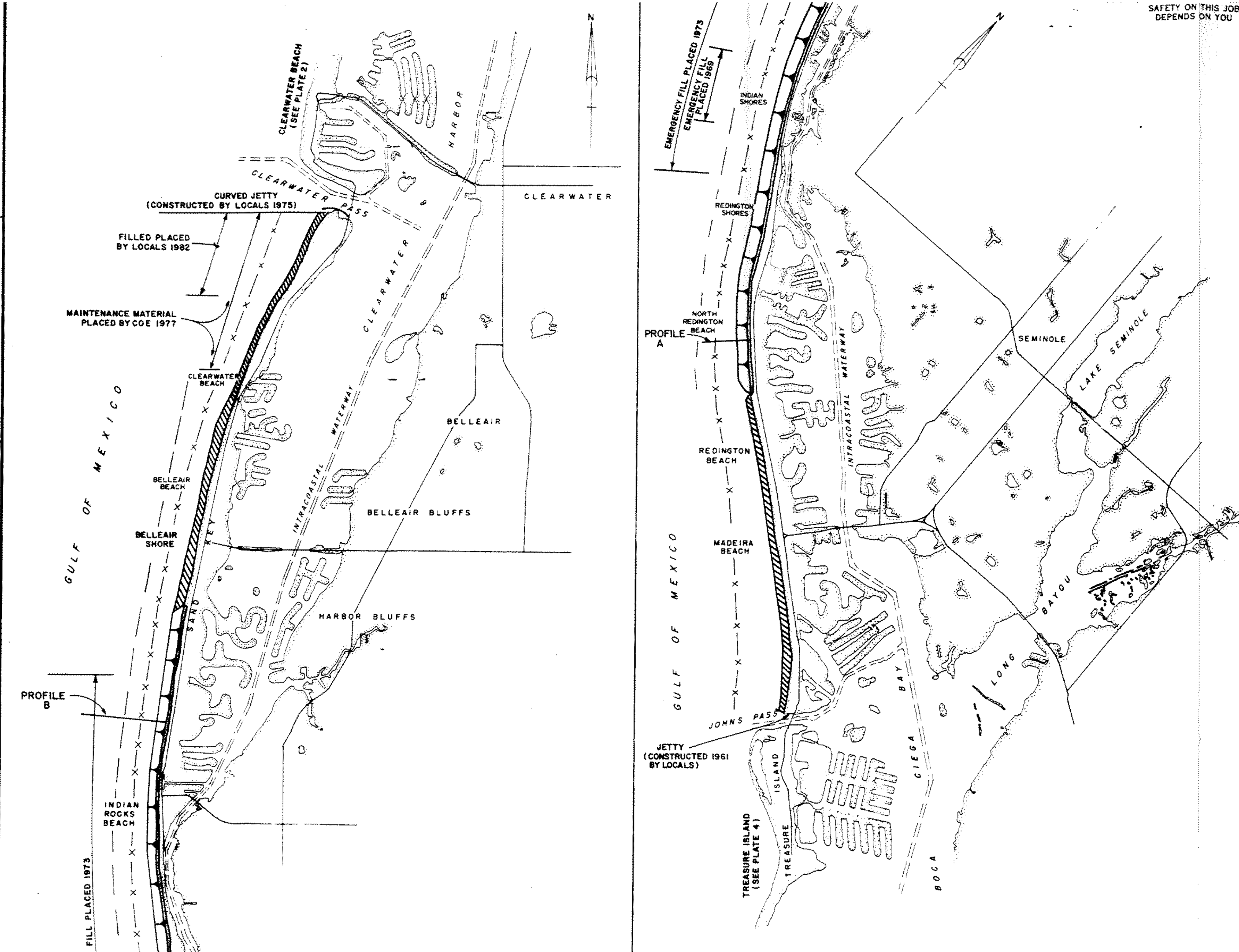
BEACH EROSION CONTROL PROJECT REVIEW STUDY
PINELLAS COUNTY, FLORIDA

HONEYMOON ISLAND
CALADESI ISLAND
CLEARWATER BEACH ISLAND

RECOMMENDED PLAN

SAFETY ON THIS JOB DEPENDS ON YOU

NO.	SYM.	ZONE	REVISIONS DESCRIPTION	DATE	APPROVED



VICINITY MAP

GRAPHIC SCALE

2000' 0 2000' 4000'

LEGEND

— — — INITIAL RESTORATION AUTHORIZED

—x—x— PERIODIC NOURISHMENT AUTHORIZED

40' BERM AT +6 ELEV.

APPROXIMATE TOE OF FILL

1 VERTICAL TO 20 HORIZONTAL TO MLW

1 VERTICAL TO 30 HORIZONTAL MLW TO EXISTING BOTTOM

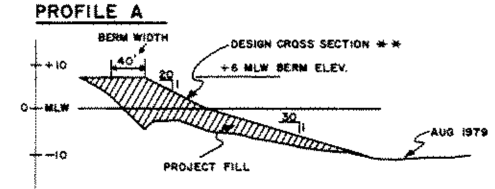
RECOMMENDED PLAN

INITIAL AND PERIODIC NOURISHMENT * 7.3 MILES

PERIODIC NOURISHMENT * 12.3 MILES

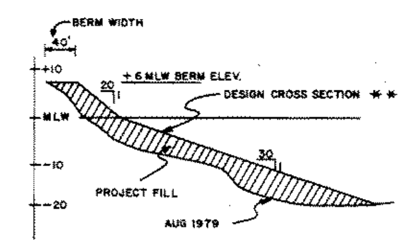
* AS AUTHORIZED THROUGH THE USEFUL LIFE OF THE PROJECT

PROFILE A



TYPICAL CROSS SECTION

PROFILE B



TYPICAL CROSS SECTION

** AUTHORIZED AND RECOMMENDED CROSS SECTION

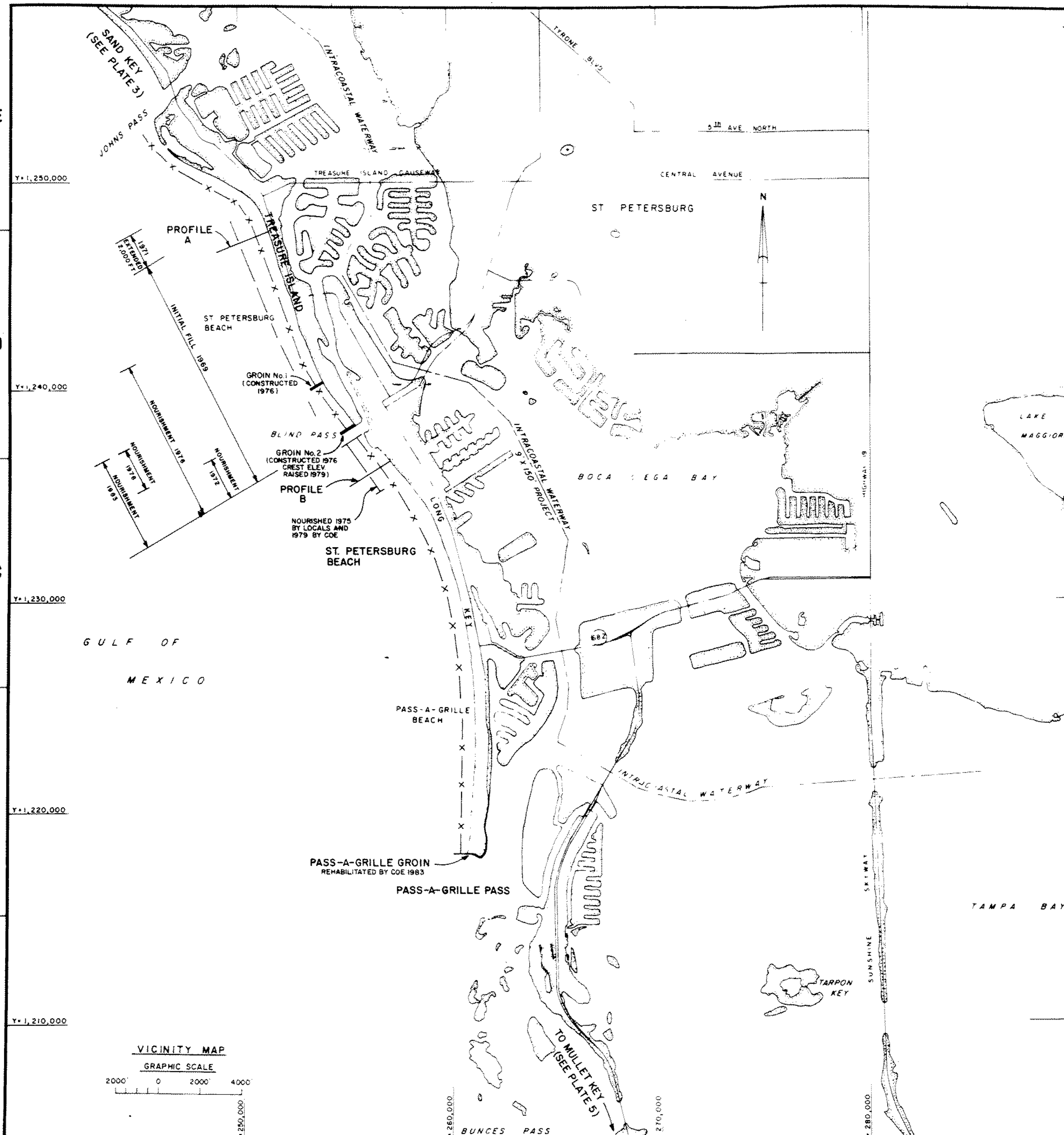
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

BEACH EROSION CONTROL PROJECT REVIEW STUDY
PINELLAS COUNTY, FLORIDA

SAND KEY SEGMENT

RECOMMENDED PLAN

D.O. FILE NO. 58-34,521



LEGEND

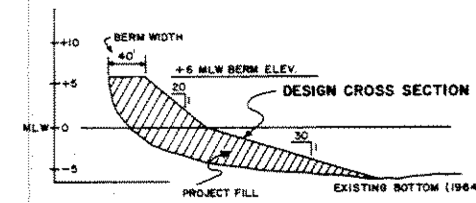
— — INITIAL RESTORATION AUTHORIZED

—x— PERIODIC NOURISHMENT AUTHORIZED

RECOMMENDED PLAN

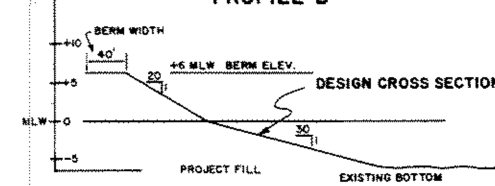
CONTINUED PERIODIC NOURISHMENT AS AUTHORIZED THROUGH THE USEFUL LIFE OF THE PROJECT

PROFILE A



TYPICAL CROSS SECTION

PROFILE B



TYPICAL CROSS SECTION

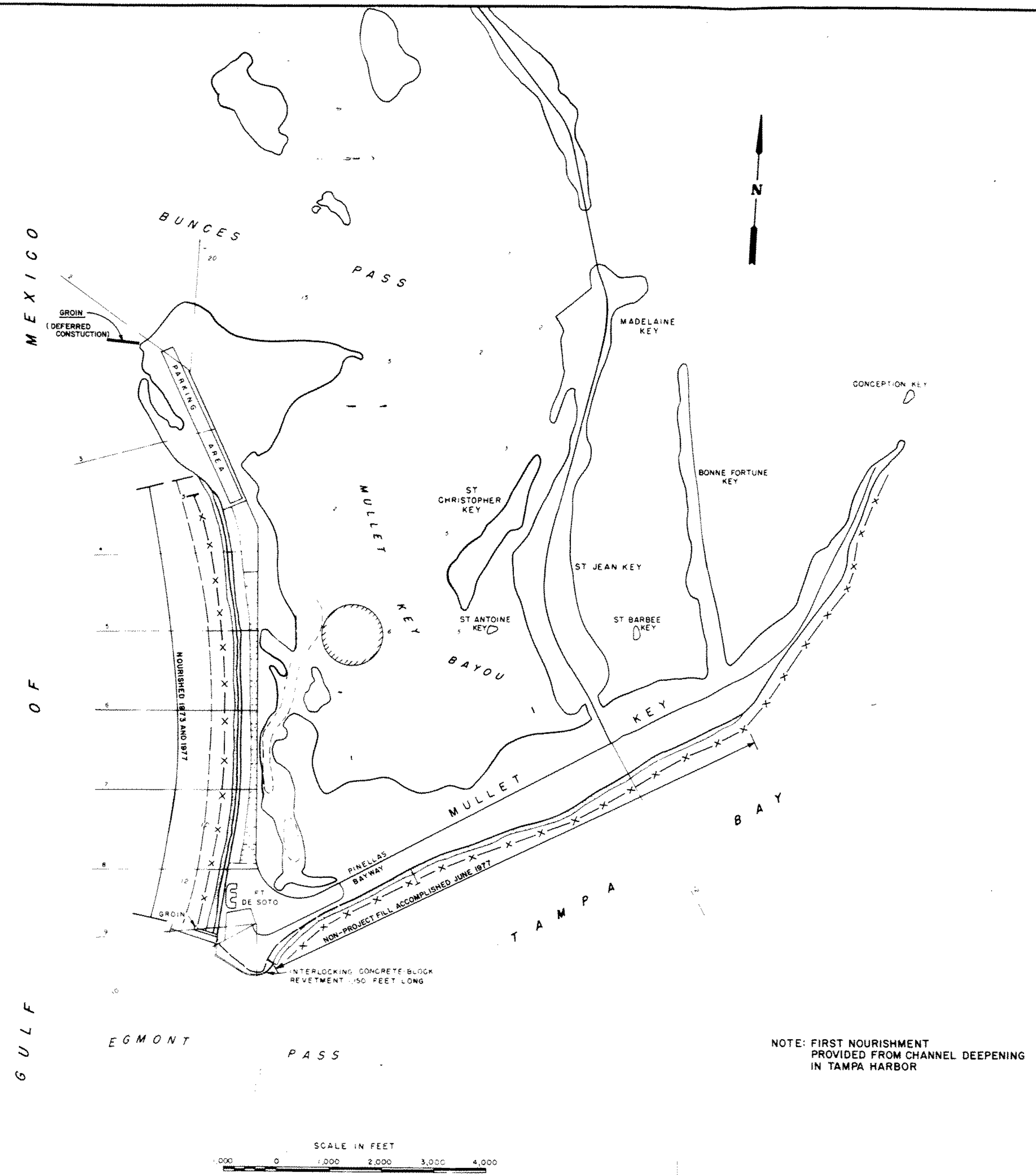
* AUTHORIZED AND RECOMMENDED CROSS SECTION

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

BEACH EROSION CONTROL PROJECT REVIEW STUDY
PINELLAS COUNTY, FLORIDA

TREASURE ISLAND AND LONG KEY

RECOMMENDED PLAN



NOTE: FIRST NOURISHMENT
PROVIDED FROM CHANNEL DEEPENING
IN TAMPA HARBOR

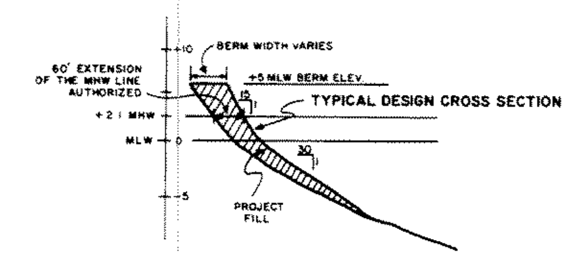
LEGEND

—— —— INITIAL RESTORATION AUTHORIZED

——x—— PERIODIC NOURISHMENT AUTHORIZED

RECOMMENDED PLAN

CONTINUE PERIODIC NOURISHMENT, AS AUTHORIZED THROUGH THE USEFUL LIFE OF THE PROJECT.



* AUTHORIZED AND RECOMMENDED CROSS SECTION

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

BEACH EROSION CONTROL PROJECT REVIEW STUDY
PINELLAS COUNTY, FLORIDA

MULLET KEY SEGMENT

RECOMMENDED PLAN

APPENDIX A
INTRODUCTION AND PROBLEM IDENTIFICATION

BEACH EROSION CONTROL REVIEW STUDY
PINELLAS COUNTY, FLORIDA

APPENDIX A

INTRODUCTION AND PROBLEM IDENTIFICATION

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FIGURES

INCLOSURES & PLATES

FOLLOW TEXT

BEACH EROSION CONTROL REVIEW STUDY
PINELLAS COUNTY, FLORIDA

APPENDIX A

INTRODUCTION AND
PROBLEM IDENTIFICATION

1. This appendix augments information contained in the main report. Accordingly, topics presented in the main report in sufficient detail are not discussed in this appendix.

PRIOR STUDIES AND REPORTS

Pinellas County, Florida, Beach Erosion Control Study

2. A Corps of Engineers report printed as House Document No. 380, 83rd Congress, 2nd Session (HD 380/83/2), dated 29 April 1954 recommended Federal participation in a beach erosion control project at Pinellas County. A summary of this report is included as an inclosure to this appendix. The project was placed in the inactive category in 1961. The report summarizes other studies prior to 1954.

Clearwater Pass, Florida

3. A Corps of Engineers report printed as HD 293/86/2 dated 1959, recommended Federal participation in construction of a channel and turning basin at Clearwater Pass. The project is a channel 10 feet deep by 150 feet wide from deep water in the Gulf of Mexico through Clearwater Pass, thence 8 feet deep by 100 feet wide eastward to the authorized IWW; a side channel 8 feet deep by 100 feet wide from the inner channel northward to the Clearwater Island Marina with a turning basin 8 feet deep, 100 to 450 feet wide, and 850 feet long. The length of the project is about 3 miles. It was completed in 1961.

Pass-A-Grille Pass Section 107 Navigation Study

4. A Corps of Engineers report dated 17 July 1964 recommending construction and maintenance of an entrance channel at Pass-A-Grille Pass 10 feet deep by 150 feet wide across the gulf bar, thence 8 feet deep by 100 feet wide to the Intracoastal Waterway. The project length is about 2.9 miles and was completed in .

Johns Pass Section 107 Navigation Study

5. A Corps of Engineers report dated 2 December 1964 recommending construction and maintenance of an entrance channel at Johns Pass 10 feet deep by 150 feet wide across the gulf bar, 8 feet deep by 100 feet wide into the Pass, thence 6 feet deep by 100 feet wide to the Intracoastal Waterway. Length of the project is about 2.2 miles and was completed in 1968.

Beach Erosion Control Study on Mullet Key, Florida

6. A Corps of Engineers report printed as HD 516/89/2, dated 1 July 1965, recommended Federal participation in a beach erosion control project at Mullet Key, Florida. The project provided for construction of 6,750 feet of recreational beach; a fronting protective beach 60 feet wide; an anchor groin 4,750 feet long at the south end of the beach; a deferred groin at the north end of the beach; and a revetment 1,150 feet long around the southwest point of the Key, if needed. Federal participation was 70 percent of the first cost and nourishment cost for an initial 10-year period. The initial nourishment was implemented in 1973.

Beach Erosion Control Study, Pinellas County, Florida

7. A Corps of Engineers report printed as HD 519/89/2 dated 10 October 1966 recommended Federal participation in a beach erosion control project for Pinellas County beaches, excluding Honeymoon and Caladesi Islands and Mullet Key. A thorough summary of this report is included as an inclosure to this appendix. Long Key and Treasure Island segments of this project have been implemented.

G&DDM Pinellas County, Florida, Beach Erosion Control Project, Treasure Island Restoration

8. A Corps of Engineers design memorandum dated July 1968 detailing the project design to be implemented at Treasure Island.

G&DDM Mullet Key, Florida, BEC Project

9. A Corps of Engineers design memorandum dated April 1971 detailing the project design to be implemented at Mullet Key.

G&DDM Addendum I Pinellas County, Florida

10. A Corps of Engineers report detailing the design of the third periodic nourishment at Treasure Island dated April 1975.

G&DDM Addendum II Pinellas County, Florida

11. A Corps of Engineers report detailing the design of the Long Key beach restoration dated September 1978.

Hurricane and Dunedin Passes Section 107 Navigation Study

12. A Corps of Engineers report dated 1980, recommending Federal participation in a navigation project at Hurricane and Dunedin Passes. Approval of this report is ongoing.

Letter Report on Extending Federal Participation in the Continued Nourishment of Treasure Island

13. A Corps of Engineers report dated 20 June 1980, recommending extending Federal participation through project year 15 for nourishment of the Treasure Island segment of the Pinellas County BEC project.

G&DDM Addendum III, Pinellas County BEC Project

14. A Corps of Engineers report dated February 1982 detailing the design of project beach for the southernmost 4,200 feet of Treasure Island shoreline and the rehabitation of Pass-A-Grille groin on Long Key.

Gulf Coast Passes Navigation Study

15. A Corps of Engineers report studying the gulf coast passes and problems. The study is currently underway.

16. Table A-1 summarizes other reports printed on this subject.

EXISTING FEDERAL PROJECTS

17. There are several existing Federal water projects located within the confines of the study area and within the general vicinity. These projects are basically two types: (1) navigation and harbor projects and (2) beach erosion control projects. Project maps and description of the existing projects are found on the plates following this appendix.

EXISTING CONDITION PROFILE

HUMAN RESOURCES

Population

18. Estimates of the population of the state, counties, and municipalities of Florida are made each year by the Population Program, Bureau of Economic and Business Research (BEBR), University of Florida. These are released annually under the title Florida Estimates of Population. The base for any estimate of population change is generally the most recent census enumeration.

19. Persons are considered to be inhabitants of Florida if at the time a census is taken they claim a designated Florida community as their usual place of residence, that is, where they "live and sleep most of the time." This place may not be the person's legal or voting residence or domicile, although it usually is. The Census of Population taken once every ten years

TABLE A-1

OTHER RELATED REPORTS

Title	Origin	Date
Preliminary report on Proposed Development of Honeymoon & Caladesi Islands	Coastal Engineering Laboratory of the University of Florida (CELUF)	Dec 1958
Recommendations on Beach Erosion Control & Stabilization of Seawall at Pass-A-Grille Beach	CELUF	Mar 1959
Report of Coastal Engineering Study at Treasure Island	CELUF	May 1959
Report on Coastal Engineering Study at Madiera Beach	CELUF	Mar 1960
Final Report on a Proposed Jetty at Honeymoon Island	CELUF	Jul 1962
Clearwater, Florida Comprehensive Plan	Clearwater City Zoning and Planning Board	Oct 1962
Beach Erosion Control Study, Long Key, Pinellas County, Florida	Gee & Jensen Consulting Engineers	Mar 1971
Study to Determine Behavior of Project Fill for BEC, Treasure Island, Florida	Department of Coastal & Oceanographic Engineering U of Fla.	Dec 1971
Storm Tide Frequency Analysis for the Gulf Coast of Florida, TM NWS Hydro-20	NOAA	Apr 1975
Demographic Study Pinellas County, Florida	Pinellas County Planning Council (PCPC)	Apr 1978
Pinellas County General Plan, Recreation, & Open Space	PCPC	Apr 1979
Pinellas County General Plan, Conservation & CZM	PCPC	Apr 1979
Economic Base Study Pinellas County, Florida	PCPC	Apr 1980

provides the basic statistics about the population. Data from the 1980 Census are included in the 1981 Florida Statistical Abstract. The numbers of inhabitants and housing units for the state, counties, planning districts, standard metropolitan statistical areas, and municipalities are presented in the Abstract. Detailed characteristics of the population released by the Bureau of the Census as they are compiled and are presented in the Abstract. Reports made available by the U.S. Government Printing Office, Washington, D.C. and by the Public Information Office of the U.S. Department of Commerce are available as cross references.

20. The U.S. Bureau of the Census also takes counts of people in small areas at times other than the census years and frequently makes estimates of the population and its characteristics. These estimates are found in Current Population Reports, P-Series. Projections of the population of Florida counties and estimates of such demographic characteristics as age, race, sex, and housing are made by the BEBR Population Program and published in Population Studies. During 1981 and 1982 Population Studies included subsequent detailed population characteristics as released by the Census Bureau.

21. Counties and municipalities are political entities, the boundaries of which are determined by legislative action. But from a sociological point of view the community of which a person considers himself or herself to be a part may not correspond to such a legal entity. Terms like "Greater Jacksonville" or "the Miami area" are used to indicate the real community. People do not hesitate to cross city or county limits or even state lines to work, to buy or sell, or to seek cultural, medical, recreational, or social services. For this reason the U.S. Bureau of the Census has designated communities known as standard metropolitan statistical areas (SMSAs). The standard metropolitan statistical area is defined generally as "a large population nucleus together with the adjacent communities which have a high degree of economic and social integration with it. Official definitions are made in terms of entire counties to facilitate the gathering and comparison of statistical data."

22. A new set of definitional standards has been prepared by the Office of Federal Statistical Policy and Standards. Section 1 states that a Metropolitan Statistical Area (MSA) will take the place of the previously defined SMSA. To qualify as an MSA an area must have either:

a. A city with a population of at least 50,000 within its corporate limits, or

b. A Census Bureau urbanized area of at least 50,000 and a total MSA population of at least 100,000.

23. Two new MSAs have been added recently in Florida: Fort Walton Beach and Ocala. Additional MSAs and modifications of the boundaries of previously defined SMSAs are announced as further processing of Census data is made.

24. A map showing the location of the standard metropolitan statistical areas in Florida is shown on Figure A-1. Figure A-1 shows how BEBR population studies of population growth, standard metropolitan statistical areas and market regions are closely correlated to State planning regions.

25. A region that is usually larger than an SMSA is the market region. As defined by the BEBR, a market region represents those counties from which a metropolitan area draws trade and in which its lending institutions make loans. A map of market areas is shown on Figure A-1.

26. Agencies of the state government have designated various groups of counties as being parts of districts. There are eleven planning districts, each containing several counties which have common interests and needs for planning development in the area. A map showing the latest pattern of county assignment is provided in Figure A-1.

27. The BEBR population projections are recognized as the official State estimates of population and population growth and are used for State/county/city revenue sharing and are State planning studies used for the allocation of State resources. The Florida Comprehensive State Outdoor Recreation Plan, updated and published every 5 years, is based on data developed by the DNR Division of Recreation and Parks and BEBR population projections.

28. The population of Pinellas County has been growing rapidly since the early 1950's. In 1950, the population was just over 159,000. By 1980, over 728,000 people lived in Pinellas County, a 458 percent increase. The 1970 and 1980 populations of Pinellas County by municipality are listed on table A-2.

29. Baseline population estimates based on the University of Florida data are provided in table A-3. In addition, table A-3 provides projected estimates of tourist visiting Pinellas County provided by the State.

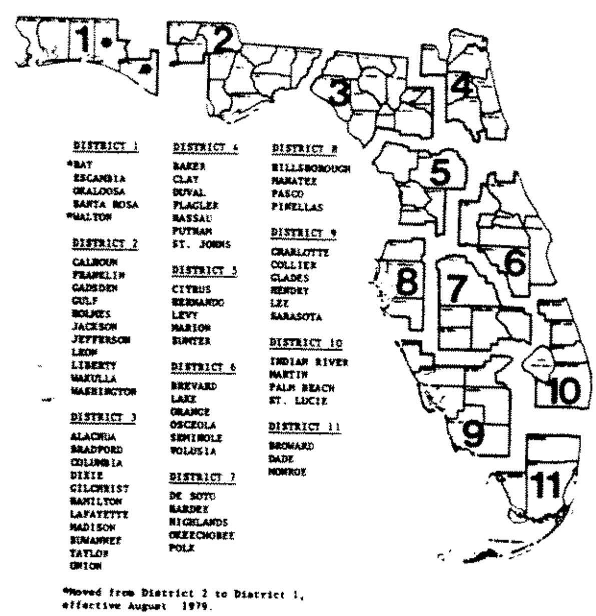
Composition and Characteristics *

30. The population residing within Pinellas County during the latter half of the 1970's has resulted from a quarter century of dramatic growth and exhibits a distinctive profile. Many of the features that contribute to this distinctness are best appreciated by comparing the composition found locally with that of state and national populations.

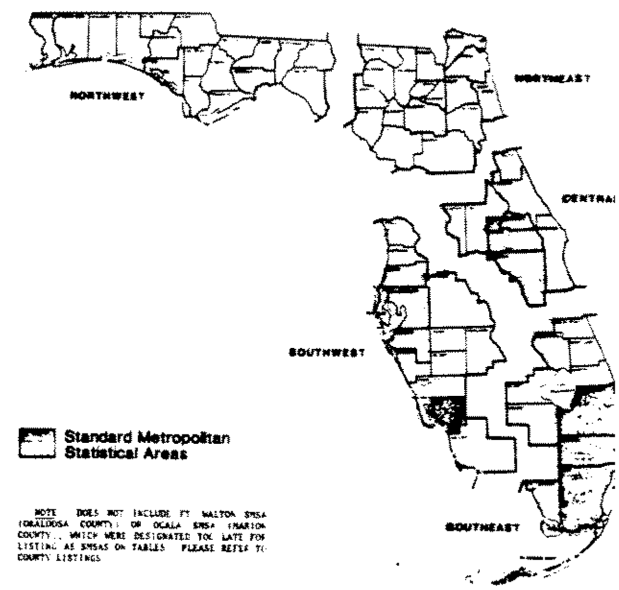
31. Density. Pinellas County is the second smallest of the counties of Florida and statistics from the 1980 Census indicate that it ranks third in the size of its population. As a result, this county has the highest average density of any in the state; 2,749 persons per square mile. This is

* Source: Demographic Study Pinellas County, Pinellas County Planning Council (updated to reflect 1980 Census figures).

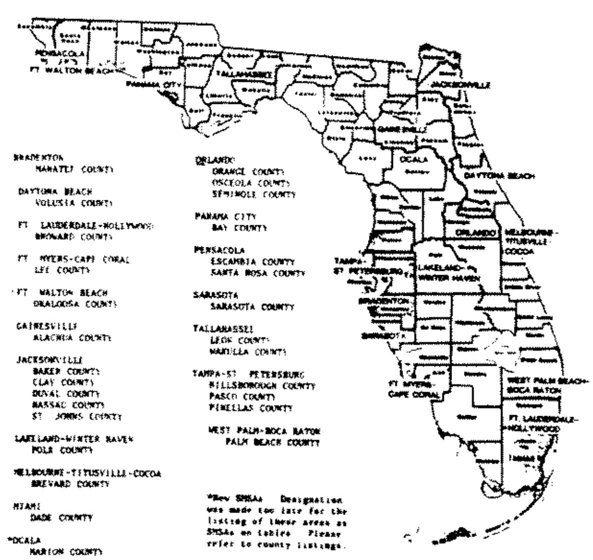
Planning Districts



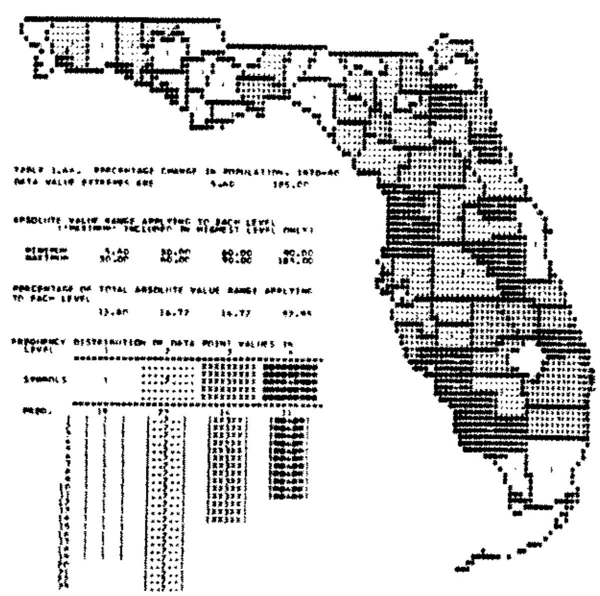
Market Regions in Florida



Counties and Standard Metropolitan Statistical Areas



Percentage Change in Population, 1970-1980



State Area Classifications for Florida Population and Recreational Planning Projections

FIGURE A-1

TABLE A-2

RESIDENT POPULATION OF PINELLAS COUNTY[1/]

1970 and 1980

	1970	1980
Belleair	2,962	3,673
Belleair Beach	952	1,643
Belleair Bluffs	1,910	2,522
Belleair Shore	124	80
Clearwater	52,074	85,450
Dunedin	17,639	30,203
Gulfport	9,976	11,180
Indian Rocks Beach	2,666	3,717
Indian Shores	791	1,012
Kenneth City	3,862	4,344
Largo	24,230	58,977
Madeira Beach	4,177	4,520
North Redington Beach	768	1,156
Oldsmar	1,538	2,608
Pinellas Park	22,287	32,811
Redington Beach	1,583	1,708
Redington Shores	1,733	2,114
Safety Harbor	3,103	6,461
St. Petersburg	216,159	236,893
St. Petersburg Beach	8,024	9,254
Seminole 2/	2,121	4,586
South Pasadena	2,465	4,188
Tarpon Springs	7,118	13,251
Treasure Island	6,120	6,316
Total Incorporated	394,382	528,767
Total Unincorporated	127,947	199,642
Total County	522,329	728,409

1/ Source: Univ. of Florida, Bureau of Economic & Business Research, Florida Population: A Summary of 1980 Census Results. Data from U.S. Bureau of the Census.

2/ Not incorporated in 1970; however, the Bureau of the Census has determined the April 1, 1970 population count.

Table A-3

POPULATION PROJECTIONS[1/]

Year	Residents: Pinellas County	Residents: Florida	Pinellas County Tourist
1980	728.4	9,740.0	-
1985	796.0	11,084.2	4,576.5
1990	859.3	12,304.2	5,054.4
1995	933.7	13,463.3	5,580.9
2000	1,003.1	14,592.6	6,156.0
2010	1,125,1	16,367.5	-
2020	1,224.6	17,815.4	-

1/ Units of 1,000.

more than three times as dense as the second ranking county, Broward. Pinellas compares closely with average density, 2,760 persons per square mile, for those areas classified as urban in the 1970 census. The cities of Dallas, Texas, and Phoenix, Arizona, each have slightly less area than Pinellas County and had comparable densities of 3,179 and 2,346 persons per square mile respectively in 1970.

32. Age. It is the age structure of the resident population which presents the most noticeable deviation from the national pattern. The proportion that is 65 years or older is more than three times the rate for the nation, while the age groups below 55 years of age show progressively smaller percentages. This unusual pattern is reflective of the recreation-retirement orientation of the county which attracts a large number of retired or semi-retired in-migrants. The retirement orientation of the community also acts to encourage an out-migration of young adults which further reduces the proportion in the younger age groups.

33. There is no reliable data source for the age structure of seasonal residents, but it is very likely that this group shows an even greater tendency toward older ages. The flexibility of time necessary to spend more than onemonth in a different residence is facilitated by the independence from employment ties that is common among the retired and semi-retired.

34. Sex. The unusually high proportion of females to males is another effect of the age structure found among residents and in-migrants. With their longer life expectency, many wives of retire couples survive their husbands by several years. There is also a substantial number of single older females among the in-migrating population. Females thereby become a progressively larger share in the older age bracket.

35. Race. Pinellas County shows a smaller than normal component of black population even though Florida is slightly ahead of the national average. This under representation of black population is a characteristic that is common to all of the west coast counties as far north as Citrus County. Only the Hillsborough population is more than 10 percent black. Though the difference is much less, a similar pattern occurs among other racial groups. In all of these counties, the low proportion of black population is accounted for by the high proportion of the population that is composed of in-migrating retired persons who are predominantly white.

36. The spatial distribution of the black population within Pinellas County is very uneven. St. Petersburg (75 percent), Clearwater (14 percent), and Tarpon Springs (3 percent) accounted for 92 percent of this group and no other city accounted for as much as 2 percent in 1970. Within St. Petersburg, only five census tracts accounted for 62 percent of the county total. One tract in Clearwater contained 3 percent of the total. In the remainder of the county, there were only two tracts that contained as much as 2 to 3 percent of the total.

37. Education. The educational attainment of Pinellas residents 25 years old and over in 1970 is comparable to both the State of Florida and the nation. Available data for the local population does not permit the direct comparison of the educational attainment of different age groups. However, the total population and the working-age population would both show a significantly higher median school years completed and percentage of high school graduates that the population 25 years old and over. This is to be expected because of the large proportion of older persons in the local population who typically have less formal education and the high percentage of persons 16 to 24 years old who are either high school graduates or still in school.

38. Household Size. With an average of only 2.25 persons per household, Pinellas ranks with Charlotte and Sarasota Counties for the smallest household size. All three of these counties show an exceptionally high proportion of retired residents with a correspondingly older age structure. Within this age group, the two-person household predominates and is supplemented by a large number of single-person households made up of surviving spouses. The unusual size of the latter group is readily seen in the abnormally high percent of total household population that is comprised of primary individuals. The distribution of family heads between male and female is about the same as the state and the national averages.

ECONOMY AND DEVELOPMENT *

39. Economically, Pinellas County has been growing steadily since the early 1960's, with the exception of the recessionary period of the mid 1970's.

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* Source: Economic Base Study, Pinellas County, Pinellas County Planning Council.

Recent migration of people and industry to Pinellas County can be attributed, in part, to natural amenities such as climate, proximity to air, water and rail transportation, and quality of life. Between 1970 and 1978, almost 800 firms moved to, or expanded in Pinellas County, accompanied by a 44 percent increase in population and a 188 percent growth in retail sales.

Industrial Growth

40. The potentials for diversifying the local economy and expanding the county's manufacturing base have improved with local government support of industrial activity. Since 1970, new plants and plant expansion have totaled 790 creating 15,205 new jobs (table A-4). Many of the largest industrial employers in the county are manufacturers of electric and electronic components and, similarly, many of the firms now expressing interest in the county are high technology firms. Increased employment in the manufaturing sector and increased reliance on manufacturing firms is expected in the future.

TABLE A-4
NEW PLANTS AND MAJOR PLANT EXPANSIONS
Pinellas County, 1970-1978

Year	New Plants and Expansions	Number of Jobs Created
1970	61	2,156
1971	60	2,459
1972	93	1,944
1973	52	1,692
1974	18	624
1975	47	1,368
1976	69	700
1977	128	1,381
1978	262	2,881
	790	15,205

Source: Committee of 100, Pinellas County Industry Council and Pinellas County Tax Assessor

Financial Activity

41. Growth in Pinellas County has been accompanied by growing financial interest and activity in the area. Financial activity can be measured in a number of ways: banking activity, new construction, or capital investment.

Using any of these three measures, it is apparent that Pinellas County has been financially growing and should continue to experience positive growth in the future. Over the last decade[1], bank deposits have grown by 151 percent, savings and loan deposits by 462 percent, the value of new construction by 225 percent and new capital expenditures in manufacturing by 121 percent (table A-5). These increases represent a growing and maturing financial community.

TABLE A-5
FINANCIAL ACTIVITY IN PINELLAS COUNTY
1968-1978
(Thousands of Dollars)

	1968	1978	Percent Change
Bank Deposits	$1,141,286	$2,862,915	151%
S&L Deposits	815,948	4,585,246	462%
Value of New Construction	151,174	491,801	225%
New Capital Expend in Manufacturing*	9,100	20,100	121%

* (1967-1976)

Source: Florida Bankers Association
Florida Savings and Loan League
Florida Statistical Abstract, 1969; 1972; 1978

42. There are currently 43 banks and 9 savings and loan associations based in Pinellas County, accounting for 51 percent and 76 percent of all deposits in the Metro area for commercial banks and savings and loan associations, respectively. Savings and loan deposits have reached $4.8 billion with total savings and loan assets over $5.5 billion. Commercial bank deposits are now over $2.8 billion while bank loans climbed toward $1.7 billion, a loan to deposit ratio of .586. This ratio has been increasing over time, indicating more local financial activity and capital investment in the area.

43. The total value of building permits issued in 1978 was almost $500 million, over twice as much as the value of 2 years ago. The majority of new construction is residential, accounting for 70 percent of the total value of new construction. This is indicative of a growing population and increased demand for retirement and seasonal homes.

44. In 1976, new capital investment in manufacturing in Pinellas County topped $20 million, ninth in the state. The value of industry shipments reached $772 million, eighth in the state. Increased manufacturing activity in Pinellas County has, in all likelihood, resulted in a better investment profile for the county and current investment figures are probably higher than the latest available figures.

[1] Figures represent 1968-1978, the latest annual statistics available - except manufacturing capital expenditures, where a 1976 figure was used.

Retail Sales

45. One indicator of economic growth and vitality in an area is retail sales. This is particularly true in relation to the Pinellas County economy where the economy has historically been heavily dependent on commercial trade. Retail sales topped $3.2 billion in 1978 in Pinellas County, a 188 percent increase since 1970 (figure 6), and accounted for 52 percent of all retail sales in the Tampa-St. Petersburg metro area. Retail sales in Pinellas remained the third highest of all Florida counties in 1978, trailing behind Dade and Broward Counties. The historical growth in retail sales in Pinellas reflects increases in population, economic activity and cost of living.

46. All of the major retail sales categories experienced substantial growth, in both absolute and relative terms, during the 1972-1978 period (table A-6). The largest absolute increase in sales was experienced in the automotive group ($410.8 million), followed by food sales ($273.2 million). The largest percent increases were found in food sales (116.9%), furniture appliances and furnishings (116.3%), and automotive sales (115.2%). Again, these increases are indicative of a growing population and increased numbers of tourists visiting Pinellas County. Since 1975, food, eating and drinking places and automotive sales have been increasing at faster rates than total retail sales.

TABLE A-6
RETAIL SALES BY STORE GROUP
(Thousands of Dollars)

	1972	1975	1972-1975 % Change	1978	1975-1978 % Change
Total Sales	$1,557,659	$2,195,957	(41.0)	$3,234,933	(47.3)
Food	298,752	444,849	(48.9)	647,860	(45.6)
Eating & Drinking Places	132,002	195,084	(47.8)	313,387	(60.6)
General Merchandise	268,262	409,616	(52.7)	541,476	(32.2)
Furniture, Furnishing & Appliances	85,392	146,543	(71.6)	184,725	(26.1)
Automotive	356,695	443,229	(24.3)	767,478	(73.2)
Drug	58,267	73,682	(26.5)	96,912	(31.5)

Source: Sales and Marketing Management, "Survey of Buying Power," Bureau of the Census, Census of Business, Retail Trade, Florida, 1972.

Tourism

47. It is evident from the increasing number of persons employed in the trade and service sectors that tourism plays an important role in the economy of Pinellas County. Growth and development have been, and still are, integrally related with the tourist industry. In 1978, an estimated 3.7 million tourists traveled to Pinellas County by air and automobile (table A-7). Tourists added over $1.2 billion to the local economy, the greatest portion going for food, lodging, entertainment, and gasoline.[1]

TABLE A-7
PINELLAS COUNTY TOURIST, 1978 1/
(Air and Auto Only)

First Quarter	1,081,800
Second Quarter	903,100
Third Quarter	830,500
Fourth Quarter	863,600
Total	3,679,000

48. In 1977, there were 798 licensed hotels and motels and over 1,700 licensed food service establishments in Pinellas County. Tourist related industries (hotels and other lodging places, amusement and recreation, automotive dealers and service stations, eating and drinking places, and miscellaneous shopping goods stores) employ almost 37,000 persons and have a combined annual payroll over $200 million.[2] Indirect benefits to the local economy are much greater. In all likelihood tourism will continue to play an important part in shaping the future of the Pinellas County economy.

Extant Shorefront Protective Structures

49. Description and Classification. A field investigation and survey of the existing shorefront protective structures of the Pinellas County coastline was conducted in 1980 by District personnel. The type, length, location, and condition of the various seawalls/bulkheads and groins by island segment was determined.

50. Illustrations and descriptions of representative seawall/bulkheads and groins are provided in figure A-1 and table A-8, respectively. The compilation of information was separated into island segments, and for Sand Key by municipality. This data is summarized in tables A-9 and A-10.

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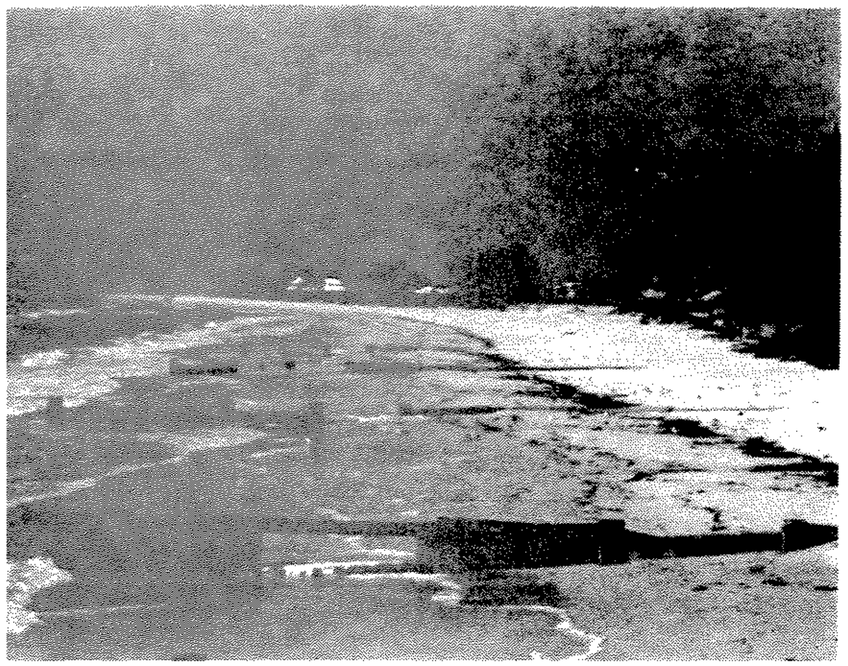
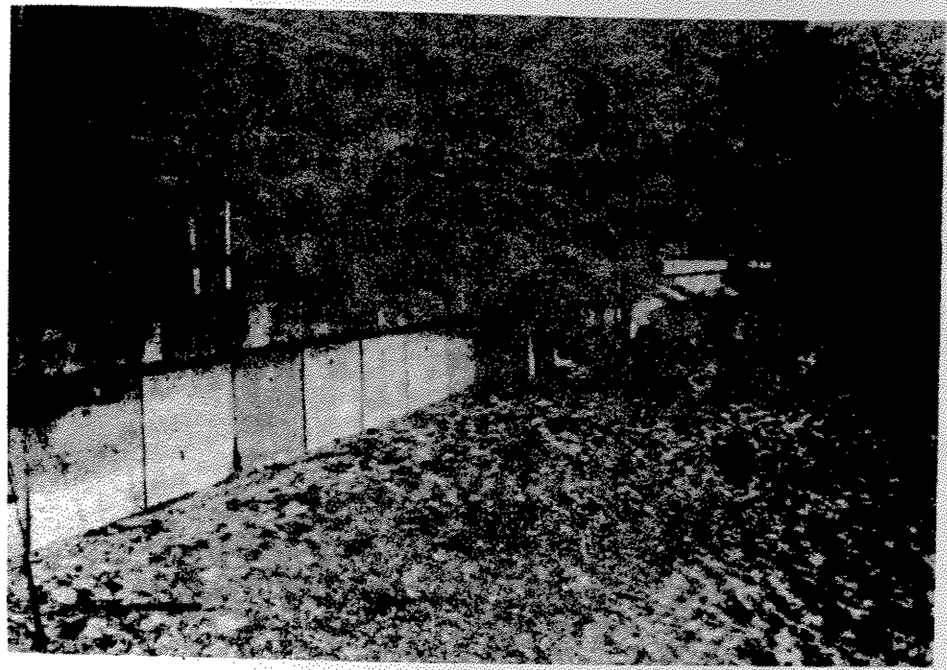
1 St. Petersburg Times/Evening Independent Research Department, Suncoast 1980.

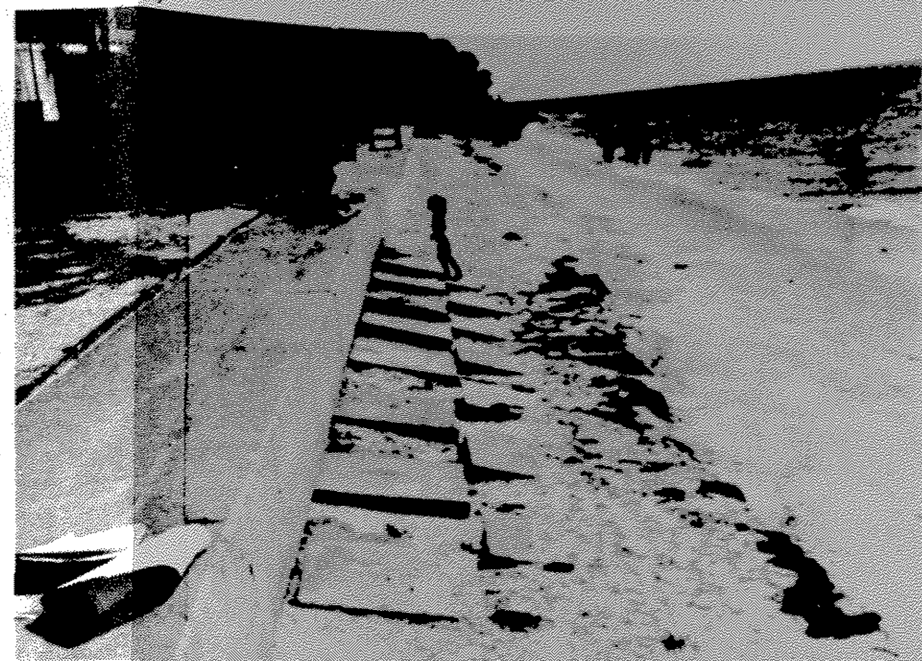
2 U.S. Department of Commerce, Bureau of the Census, County Business Patterns, 1977



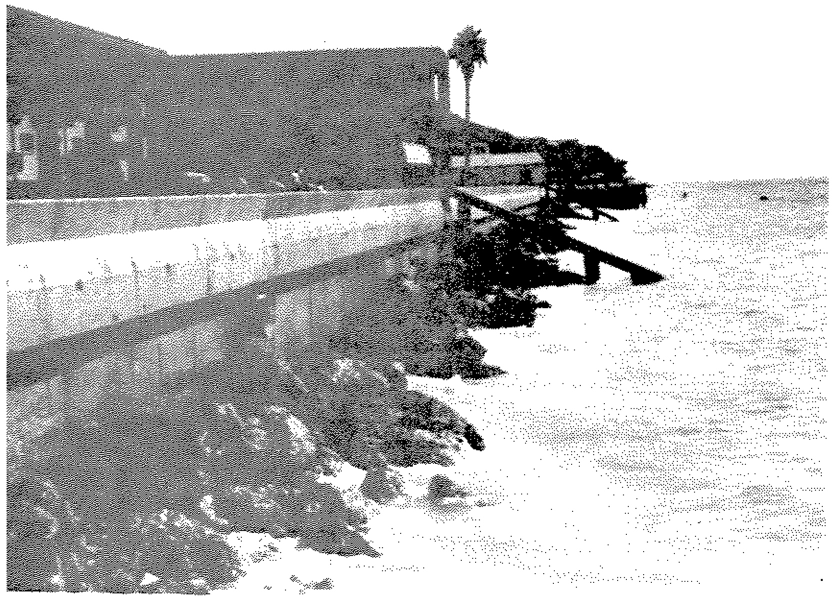
NGPILE GROIN, WOOD INSERTS (KPG)



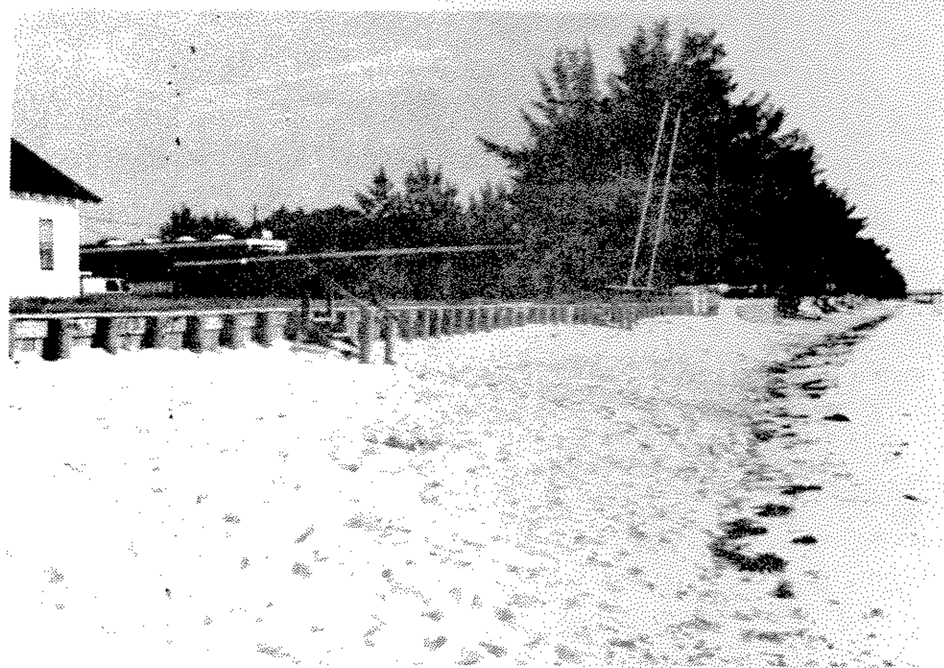
B. CONCRETE CAP & CONCRETE SHEET PILE (CC&CS)



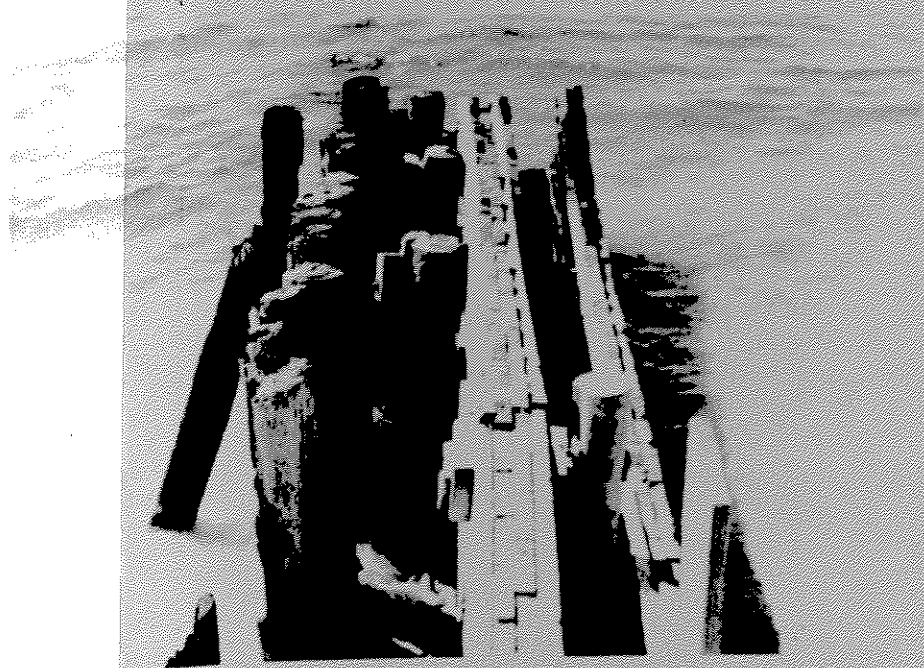
C. CONCRETE CAP & CONCRETE SHEET - PILE W/INTEGRAL SIDEWALK (CC&CS-1)



NCRETE CAP & CONCRETE SHEET-PILE
INTEGRAL SIDEWALK & TOE PROTECTION (CC&CS-2)



E. TREATED TIMBER PILE BULKHEAD (TTPB)



F. TIMBER GROIN (TG)

SHOREFRON
STRU

TABLE A-8
CLASSIFICATION AND ESTIMATED COST OF PROTECTIVE STRUCTURES

Type	Description		Estimated Value[1] Oct 80	Jan 84
KPG	Kingpile Groin, Wood Inserts	LF	$111.00	$168.00
CC&CS	Concrete Cap & Concrete Sheet Pile	LF	168.00	205.00
CC&CS*-1	Concrete Cap & Concrete Sheet Pile w/integral Sidewalk	LF	177.00	216.00
CC&CS**-2	Concrete Cap & Concrete Sheet Pile w/Sidewalk & Toe Protection	LF	206.00	252.00
CBB	Concrete Block Bulkhead	LF	91.00	111.00
TTPB	Treated Timber Pile Bulkhead	LF	84.00	103.00
TG	Timber Groin	LF	153.00	187.00
ICBR	Interlocking Concrete Block Revetment	LF	257.00	314.00
T&GSS	Tongue & Groove Steel Sheet Pile	LF	171.00	209.00

1 Jan 1984 Price levels: update from 1980 price levels. (ENR Index $\frac{382.5}{312.5} = \frac{\text{Jan 1984}}{\text{Nov 1980}} = 1.2$)

TABLE A-9
INVENTORY OF PROTECTIVE STRUCTURES

Location	Type	Classification	Length (ft)
Honeymoon Island	Groin	KPG	500
		Sandbag	800
Clearwater Beach Island	Groin	KPG	3640
	Seawall	CC&CS	5000
Treasure Island	Groin	KPG & TG	5600
	Seawall	CC&CS & TTPB	8160
Long Key	Groin	Rubble Mound	
	Seawall	CC&CS-2	1450
		CC&CS-1	2200

TABLE A-10
INVENTORY OF PROTECTIVE STRUCTURES
SAND KEY

Municipality	Structure Type 1/	Structure Condition 2/	Structure Length (ft)
Indian Rocks Beach	TTPB	Good	2100
	CC&CS	Fair	1805
	CC&CS	Good	4000
	TTPB	Poor	2050
	TG	Poor	2260
	CC&CS-1	Good	370
	TTPB	Fair	950
	CBB	Good	860
	CC&CS-3	Fair	1415
Indian Shores	CC&CS	Good	5680
	TTPB	Fair	540
	TTPB	Poor	1620
	CC&CS-1	Fair	370
	CC&CS	Poor	1150
	TG	Poor	700
	CBB	Fair	110
	CC&CS-3	Good	488
Redington Shores	TTPB	Fair	60
	CC&CS	Good	2830
	CC&CS	Fair	580
	CC&CS	Poor	880
	CBB	Fair	186
	CC&CS-3	Good	630
North Redington Beach	CC&CS	Good	3000
	CBB	Fair	860
	CC&CS-3	Good	150
Redington Beach	CC&CS	Fair	1030
	CC&CS	Good	4060
	CC&CS-3	Fair	270
Madeira Beach	KPG-3	Poor	5850
	CC&CS	Good	4930
	CBB	Fair	820
	CC&CS	Fair	1160
Total Sand Key			

1/ Type based on:
KPG - King Pile Groin
CBB - Concrete Block Bulkhead
TTPB - Treated Timber Pile
TG - Timber Groin
CC&CS - Concrete Cap, Concrete Sheet-Pile
1 = with integral sidewalk
2 = with integral sidewalk & toe protection
3 = public structures

2/ All prices updated to Jan 1983 price levels.

* = Public

Real Estate Investigations

51. Investigations were made to estimate the market value of land on Sand Key in 1980. The values used herein were based on these values updated to reflect 1983 price levels.

Land Use

52. The Pinellas County Planning Council adopted a conservation and coastal zone management program for the entire county in April 1979. This plan provides constraints and guidelines for the entire county with specific constraints relating to the barrier beaches and gulf shoreline as listed below.

53. Barrier Beaches and Gulf Shoreline. No activity should be allowed that would threaten the stability of existing or developing dune systems or of the beach itself.

54. Adoption of the coastal construction setback line for all Pinellas County beaches based on the information and studies being conducted by the State Bureau of Beaches and Shores is necessary. Until the coastal line is adopted, strict adherence to the guidelines in the Ocean Hotels 1/ case should be enforced.

55. Restoration of natural beach and dune vegetation should be encouraged countywide. Replacement of seawalls with natural systems should take place when redevelopment occurs.

56. The Board of County Commissioners should more fully exercise its powers under Chapter 161.25 F.S. and act as coordinator for beach restoration and protection projects.

57. A comprehensive, long-term study of the Gulf beaches and passes of Pinellas County should be conducted to identify tidal currents and erosion conditions, to provide a better understanding of the beach system of the county for proper management and restoration design.

58. Those areas of the barrier islands which remain in a relatively natural condition should be preserved in their entirety. Of particular importance are: the north Sand Key area, and the northern ends of Mullet Key, Treasure Island and Clearwater Beach, Honeymoon and Caladesi Islands.

1/ Ocean Hotels, Inc., vs. State of Florida Department of Natural Resources, 18th Judicial Circuit, January 3, 1974 (not appealed), established the policy that the reference point for the 50-foot setback line be the "winter" or "most landward mean high waterline."

Beach Ownership

59. In the State of Florida, all lands lying below the level of mean high tide are public property. In addition, the Florida Statutes contain provisions for establishing an erosion control line with the assent of the majority of the frontage ownership. The erosion control line is established, usually at mean high tide line, at the request of the local sponsor prior to initiating restoration under an authorized project. Once the line is established, it becomes the seaward boundary of private property and all restored beach seaward of that boundary is in public ownership. Pinellas County representatives have indicated that an erosion control line will be established at the appropriate time.

Beach Access and Facilities

60. In addition to the beach seaward of the erosion control line, there are numerous access roads and public beaches located throughout the islands. Honeymoon and Caladesi Islands are state owned and part of the State Park system. Mullet Key encompasses the county-owned park of Ft. DeSoto. Public access locations are summarized on figure A-2.

61. Parking and sanitary facilities for public use are available along the entire study area. There are (or will be) facilities at Honeymoon Island, Caladesi Island, Clearwater public beach, Redington Shores Park, War Veterans Park, Madeira Park, Treasure Island Beach, Upham Beach, Pass-A-Grille Beach, and Fort DeSoto Park.

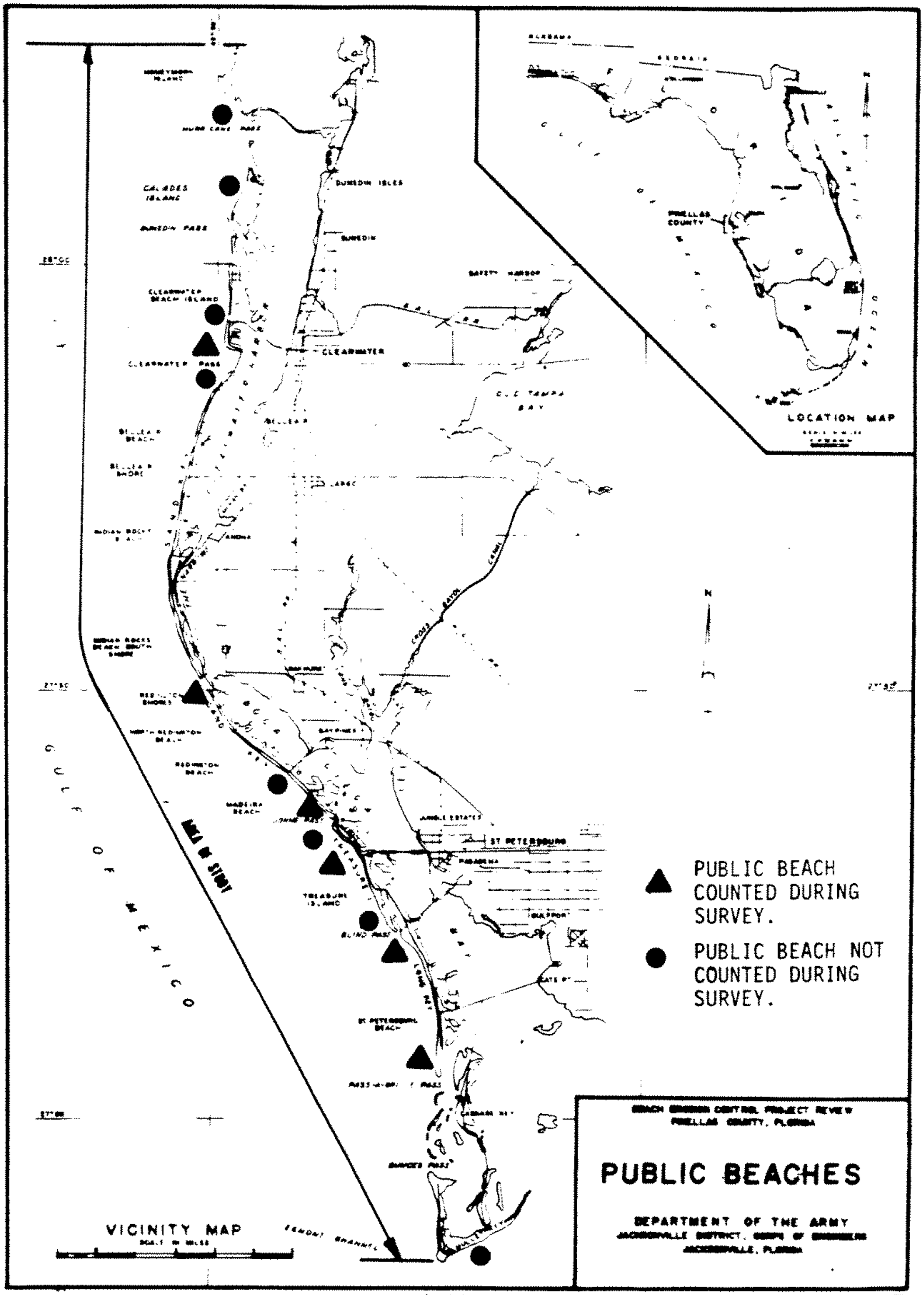
62. A survey of available public parking was conducted in September 1982. The results of this survey are summarized in Appendix D on table D-2.

NATURAL FORCES

STORMS AND THEIR EFFECTS

63. General. Records indicate that 51 tropical disturbances passed within 50 miles of Pinellas County between 1830 and 1964. Of that total, 23 were classified as being of hurricane intensity. Since 1900, 16 hurricanes and 19 tropical disturbances have passed within 50 miles of the area. Specific hurricanes and their effects on the shores of Pinellas County are discussed in paragraphs that follow.

64. Hurricane of October 11-18, 1910. Originating in the western Caribbean Sea, that hurricane passed over Cuba and moved northward in the gulf for 3 days, passing inland approximately 50 miles south of Tampa. As the storm



DUNEDIN ISLES
DUNEDIN
SAFETY HARBOR
CLEARWATER
CLEARWATER PASS
ST PETERSBURG
TREASURE ISLAND
GULF OF MEXICO
LOCATION MAP
VICINITY MAP
PUBLIC BEACH COUNTED DURING SURVEY.
PUBLIC BEACH NOT COUNTED DURING SURVEY.
PUBLIC BEACHES
DEPARTMENT OF THE ARMY

FIGURE A-3

passed southeast of Tampa Bay, water levels at the mouth of Hillsborough River were lowered to -6.7 feet by northeast winds and when the wind shifted to south some 14 hours later, they rose of +3.4 feet, a total differential of 10.1 feet. Losses were not considered severe, although several vessels in the harbor keeled down on low tide and on the return flood filled and sank.

65. Hurricane of October 21-31, 1921. That storm was considered one of the most severe to strike the gulf coast of Florida in the present century. It originated in the Caribbean Sea, followed a northerly path and crossed inland in northern Pinellas County. Almost all coastal communities along a 150-mile reach from Tarpon Springs southward reported flooding conditions which were prolonged by the slow forward movement of the storm. Along the coast of Pinellas County, full hurricane intensity winds were estimated to be between 80 and 100 miles an hour. At Tampa, where peak winds of 75 miles per hour were reported, high tides and wave action were the major causes of damage. The peak tide of 10.4 feet was the maximum since the 1848 hurricane. The estimate of damage in Tampa and immediate suburbs was $1 million, including about $400,000 general damage along the commercial waterfront, $300,000 damage to buildings, and $200,000 damage sustained by Tampa Electric Company.

66. Hurricane of September 6-22, 1926. According to local residents, damages resulting from the hurricane were exceeded only by those caused by the hurricanes of October 1921 and September 1950. It originated in the south Atlantic Ocean and passed across Florida from Miami to Punta Rassa, about 125 miles northwest of Miami. Maximum wind velocity at Tampa was 50 miles an hour. The hurricane produced a tide of 4.5 feet at Tampa and local residents reported that storm waves reached about 10 feet in height at Clearwater Beach and about 6 feet in height at Indian Rocks Beach. Such waves were reported to have caused considerable erosion damage along some sections of the beaches.

67. Hurricane of March 1932. That storm was of short duration and was caused by a low pressure area of considerable intensity which moved eastward over Florida from the Gulf of Mexico. Maximum wind velocity recorded at Tampa was 40 miles an hour from the northwest. It was reported that several islands off St. Petersburg was inundated. Waves were reported to have broken over the city pier at Clearwater Beach during the height of the storm. At that location, 15 cottages, 2 amusement pavilions, and a hotel were reported to have been severely damaged. Property damage along other sections of the beaches was reported to have been heavy.

68. Hurricane of August 31-September 8, 1935. First observed east of Turks Island in the Baham Islands and traveling toward the Florida Straits, that hurricane soon passed up the west coast of Florida and crossed inland approximately 100 miles northwest of Tampa. Maximum wind velocity at Tampa was 75 miles per hour from the southeast. Some flooding occurred in the Tampa area as tides rose to 5.3 feet above normal. It was reported that many sections of the beaches were covered with water.

69. Hurricane of October 13-21, 1944. That storm originated in the western Caribbean Sea south of Grand Cayman Island, moved across Cuba, entered the west coast of Florida about 50 miles south of Tampa, and swept northeastward almost directly over Tampa. The maximum 5-minute average wind at Tampa was 56 miles an hour from the northeast, with gusts up to 100 miles an hour. Considerable erosion damage is indicated by the reports of local residents who stated that several beach protective structures were destroyed.

70. Hurricane of June 19-27, 1945. Developing near British Honduras and moving directly northward into the gulf, that storm curved northeast and crossed Florida at a point about 75 miles north-northwest of Tampa. The hurricane, of about 2 hours' duration, was accompanied by winds of 49 miles an hour, recorded at Tampa. At Sunset Beach (Treasure Island), a half-mile section of seawall was destroyed and an entire colony of cottages collapsed due to failure of the wall and undermining of the cottages foundations. A private club located along the beach was said to have sustained damages estimated at $10,000 due to washout of the building foundations.

71. Hurricane of August 24-29, 1949. That storm formed northeast of the Leeward Islands and reached full hurricane intensity as it passed north of the Bahamas, crossing inland from West Palm each to a point on the gulf coast about 10 miles north of Tampa. Southwest winds of 50 miles an hour were reported at Tampa, with gusts up to 67 miles an hour. A tide of 4.8 feet was recorded at Tampa. At Clearwater Beach it was reported that the high tide caused water to flow across the island a short distance north of Causeway Boulevard. It was also reported that several acres of beach along the south part of Clearwater Beach Island were washed away.

72. Hurricane of September 1-7, 1950. Forming over the western Caribbean Sea and passing over Cuba and into the Gulf of Mexico, that storm paralleled the Florida coastline, described two loops near the gulf coast approximately 100 miles north of Tampa before curving southeastward to within 30 miles north of Tampa, at which point it recuved and traveled northward into Georgia. Pinellas County beaches were exposed to wind-driven waves for more than 48 hours. Total estimated damages of $600,000 ($244,000 to home and buildings, $230,000 for replacement of fill, and $123,000 damage to seawalls, streets, and sidewalks) were caused to the Pinellas County beaches. In places, the shoreline receded as much as 70 feet. Serious flooding from tides, estimated as being between 6 and 8 feet, resulted in damage to homes along the beachfront. At Blind Pass, water was reported to have been within 2 feet of the bridge decking; at Sunset Beach, on Treasure Island, 8- to 10-foot-high waves were reported. Tides were highest in Tampa since the 1921 hurricane.

73. Hurricane of September 3-13, 1960. DONNA ranked as one of the greatest storms of the century. After forming in the Cape Verde area, DONNA traveled west past Puerto Rico and Cuba and crossed directly over the central Keys. From there it curved northward along the gulf coast to a point approximately 75 miles south of Tampa, where it moved inland to emerge on the Atlantic coast at a point about 70 miles southeast of Jacksonville. In the Tampa

area, offshore winds in the first phase lowered water levels. Second-phase winds of 65 miles an hour were onshore but greatly diminished as the hurricane center moved inland over Florida. Peak tides were below 4 feet.

74. Storm of September 29, 1963. An intense low pressure area over the Gulf of Mexico, lasting almost a week, produced winds gusting up to 70 miles an hour and caused considerable damage to Pinellas County beaches. Although the storm was not a hurricane, tides were reported to the highest in 13 years, washing over all causeways between Pinellas and Hillsborough Counties. Winds, together with spring tides, caused water levels to increase 4 to 8 feet above normal. Damage was particularly severe at Sunset Beach of Treasure Island where many homeowners reported flood waters 2 feet deep. Some seawall failures occurred at Treasure Island. Total estimated damages along the beaches of Pinellas County were reported to be in excess of $500,000.

75. Hurricane of October 13-21, 1968. GLADYS formed over the western Caribbean Sea near Honduras and passed over the western tip of Cuba and into the Gulf of Mexico. The storm paralleled the Florida coastline and on 18 October curved eastward toward the Florida coast, passing inland about 70 miles north of Tampa. The storm passed over Florida and exited near St. Augustine, Florida, on 19 October. The storm caused extensive damage to the Pinellas County beaches. Emergency fill of 400,000 cubic yards was placed on Sand Key and 120,000 cubic yards was placed on Treasure Island to mitigate the effects of the storm.

76. June 15-22, 1972. Hurricane AGNES developed from a disturbance that moved eastward from the Yucatan Peninsula on June 14. The storm turned northward off the western tip of Cuba and headed into the Gulf of Mexico. It attained hurricane intensity with sustained winds of 75 knots on June 19. AGNES weakened as it moved inland and became part of a complex low-pressure system which moved through North Carolina, Virginia, Maryland, and Pennsylvania. Its associated excessive rainfall caused the most damaging floods ever recorded in the United States. Property damage in the United States attributed to AGNES was near $3.1 billion, of which two-thirds occured in Pennsylvania.

77. Damages from coastal flooding along the Gulf coast of Florida caused directly by the storm were rather light. The Corps of Engineers, in a poststorm survey, determined that tides along the west coast of Florida increased from Lee County northward. Tides were about 2 feet above normal in Lee County, 2 to 3 feet above normal in Charlotte and Sarasota Counties, and 3 to 6 feet above normal in Manatee and Pinellas Counties. A high tide of about 10 feet, m.s.l., was reported at Cedar Key.

SHORELINE AND OFFSHORE CHANGES

GENERAL

78. Comparative positions of the mean high water shoreline over the period of record for the study area have been computed and results are included in the following sections. The bases for the comparison are surveys made by the U.S. Coast and Geodetic Survey in 1873, 1926, and 1939, by the Florida Department of Natural Resources in 1975 and 1977, and by the Corps of Engineers in 1950 and 1979.

MEAN HIGH WATER SHORELINE CHANGES

79. Mean high water shoreline changes for the periods 1873 to 1950 and 1950 to 1979 are tabulated in table A-12. The changes by island segments are as follows.

80. Honeymoon Island. The data show that the island shoreline receded an average of 30 feet from 1974 to 1979. The recession indicated is an average for the island. There are reaches where the shoreline actually advanced.

81. Caladesi Island. The data show that Caladesi Island receded an average of 27 feet from 1974 to 1977. There are reaches where the shoreline has advanced or has not changed in position. The fluctuation between advance and recession of the south end of the island is due to dynamic forces associated with the adjacent inlet. Dunedin Pass has a history of rapid changes in position and inlet cross section.

82. Clearwater Beach Island. The data show that the Clearwate Beach Island shoreline receded an average of 121 feet from 1873 to 1950 and advanced an average of 175 feet from 1950 to 1979, thus indicating an overall net advance of 54 feet for the period of record. The advance indicated is an average for the island. There are reaches where the shoreline has actually receded or has not changed in position. Part of the advance in the shoreline reflects corrective action (structures and fill) undertaken by local interests.

83. Sand Key. The data show that the Sand Key shoreline receded almost over its entire length between 1873 and 1950. The extreme recession indicated at the north tip of the key (profiles 20A and 21) was due primarily to an easterly shift of that reach. As can be seen in table A-12 for the period 1950 to 1979, the shore at the north tip receded only slightly, but that was due to artificial fill made in connection with construction of a jetty and maintenance dredging of Clearwater Pass. South of that reach the shore receded continuously an average of 83 feet to Belleair Shores. The center portion of Sand Key advanced slightly, but this is due to the construction of numerous seawalls and bulkheads. The southern part of the Sand Key shoreline advanced an average of 85 feet. The advance was influenced by the jetty fill at Johns Pass and the groin field at Maderia Beach.

TABLE A-12

MEAN HIGH WATER SHORELINE CHANGES

Profile	Period 1873 to 1950 Advance	1873 to 1950 Recession	1950 to 1979 Advance	1950 to 1979 Recession	
		(feet)			
Honeymoon Island (1974-1979)					
R-1	N.A.			20	
R-3	N.A.		30		
R-4	N.A.			25	
R-5	N.A.			15	
R-7	N.A.			35	
R-8	N.A.			45	(2) 42
R-9	N.A.			15	
R-10	N.A.			110	
R-11	N.A.			30	
R-12	N.A.			60	
R-13	N.A.		80		
R-14	N.A.			85	
R-15	N.A.			45	
Caladesi Island (1974-1977)					
R-16	N.A.		60		
R-17	N.A.			110	
R-18	N.A.			35	
R-19	N.A.			20	
R-20	N.A.			70	(2) 51
R-21	N.A.			60	
R-22	N.A.			50	
R-23	N.A.			60	
R-24	N.A.			60	
R-25	N.A.		100		
R-26	N.A.		130		
R-27	N.A.		85		
R-28	N.A.		25		
R-29	N.A.			30	
R-30	N.A.		25		
R-31	N.A.			10	

(Continued)

TABLE A-12 (Continued)

MEAN HIGH WATER SHORELINE CHANGES

Profile	Period					
	1873 to 1950			1950 to 1979		
	Advance	Recession		Advance		Recession
	(feet)					
	Clearwater Beach Island					
2	N.A.					N.A.
3	180			200		
4		400		350		
5		50		50		
6		200				90
8		280		250	(2) 175	
10	(1)		(2) 121	230		
13	80			220		
15		120		70		
16		(1)		20		

(Continued)

TABLE A-12 (Continued)

MEAN HIGH WATER SHORELINE CHANGES

Profile	1873 to 1950 Advance	1873 to 1950 Recession		1950 to 1979 Advance		1950 to 1979 Recession	
	(feet)						
Sand Key							
20A		1,750				N.A.	
21		1,700				30	
22		600				330	
23		350				50	
24		180				50	(2) 83
25		50				50	
26		40				(1)	
27		(1)				20	
28		(1)				50	
29		(1)		10			
30		100		10			
31		180		10			
32		60		15	(2) 12		
33		(1)	(2) 245	20			
34	100					20	
35	100			5			
36	(1)					(1)	
37		150				10	
38		150		40			
39		(1)		20			
40		(1)		60			
41		(1)				20	
42		50				15	
43		250		60	(2) 83		
44		300		100			
45		500		105			
46		450		130			
47		200		150			
48		(1)				30	

(Continued)

TABLE A-12 (Continued)

MEAN HIGH WATER SHORELINE CHANGES

Profile	Period 1873 to 1950 Advance		Recession		1950 to 1979 Advance		Recession
			(feet)				
			Treasure Island				
58	(1)				110		
59	800				200		
60A			300		260		
61			50		140		
62	180			(2) 38	90	(2) 151	
63	N.A.				70		
64			600		160		
65			300		180		
			Long Key (1950-1978)				
69	300				N.A.		
70	600				140		
71	400				160		
72	300				110		
73	250	(2) 261			70	(2) 103	
74	200				30		
75	100						20
79	120				(1)		
83	80				110		
86			200			N.A.	
88			650			N.A.	

NOTES: 1. No change.
2. Average change for bracketed reach.
N.A. Not available.

84. Treasure Island. The shoreline of Treasure Island, except at the north end, receded between 1873 and 1950. For the period 1950 to 1979, data show that the shoreline advanced over the entire length of the island. The advance at the north end is historical and furthermore, was influenced by fill spoiled northwest of the island from dredging at Johns Pass. The advance depicted over the remainder of Treasure Island is primarily due to accretion at the Blind Pass jetty and to fill placed on the beach by the Federal beach erosion control project for Treasure Island. Details on fill quantities are provided in the prior correction action section of the main report.

85. Long Key. The data show the shoreline of Long Key has advanced an average of about 4 feet annually from 1950 to 1979. The advance was influenced primarily by the groin at the south end of the island adjacent to Pass-a-grille Pass and fill placed at the north end of the island by local interests.

OFFSHORE DEPTH CHANGES

86. Comparison of offshore depth changes are based on the surveys of 1881-1883 by the Coast and Geodetic Survey and the survey of 1950 by the Corps of Engineers and on comparison of the 1950 and 1979 Corps surveys.

87. 1881-1883 to 1950. Changes in the position of the 6-, 12-, and 18-foot depth contours from 1881-1883 to 1950 are given in table A-13. In the reach off Clearwater Beach Island for the period of record, the 6- and 18-foot depth contours receded landward an average of 416 feet and 536 feet, respectively. No information is available for the 12-foot depth contour except for about a mile at the south end of reach. In that 1-mile reach north of Clearwater Pass the 12-foot depth contour advanced seaward an average of 875 feet. In the reach off Sand Key, the 12- and 18-foot depth contours receded landward net averages of 200 feet and 210 feet, respectively. The 6-foot depth contour in that reach receded landward about 78 feet, except at the Maderia Beach where it advanced a net average of 65 feet. In the reach off Treasure Island, the 6-foot and 18-foot depth contours receded net averages of 232 feet and 424 feet, respectively. In that reach the 12-foot depth contour advanced a net average of 555 feet for about two-thirds of reach and receded a net average of 713 feet for the remaining 1 mile in the reach. In the reach off Long Key, the 6-foot depth contour advanced an average of 284 feet in the northern two-thirds and receded an average of 1,743 feet in the southern third. The 12-foot contour advanced a net average of 260 feet in the northern third and receded an average of 292 feet in the middle third. The 18-foot depth receded an average of 833 feet over the northern half of the island. Data on the 12- and 18-foot depth contours are not available for the southern part of Long Key. Records for this period are not available for Honeymoon or Caladesi Islands.

TABLE A-13
Offshore Depth Changes
1881-1883 to 1950

Profile	6-foot contour Advance Seaward	6-foot contour Recession Landward	12-foot contour Advance Seaward (feet)	12-foot contour Recession Landward	18-foot contour Advance Seaward	18-foot contour Recession Landward
			Clearwater Beach Island			
2		N. A.		N. A.		N. A.
3		900		N. A.	1, 050	
4		1, 000		N. A.		300
5		(1)		N. A.		500
6		280		150		410
8		500 (2) 416		50		1, 950 (2) 536
10		450	1, 000			690
13		(1)	1, 900 (2) 875			640
15		200	100			790
16		N. A.	500			600
			Sand Key			
20A		200		320		600
21		700		410		1, 030
22		750 (2) 470		430		1, 020
23		500		480		1, 300
24		200		380		950
25	30			330		1, 750
26	150 (2) 62			330		900
27	50			190		290
28	20			180		80
29		160		330		900
30		180		420		200
31		190		400		1, 080
32		50		330		690
33		20		200 (2) 403	900	
34		(1)		50		300 (2) 756
35		(1)		399		250
36		150		159		1, 300
37		320		220		100
38		300 (2) 178		230		1, 680
39		300		510		1, 500
40	120			980		260
41	60			90		560
42		150		450		700
43		120		640	90	
44		190		550		1, 450
45		230		390		2, 040
46		600		600		780
47		610		1, 400		150
48	1, 000			N. A.		300
			Treasure Island			
58		300	N. A.			350
59	1, 950		1, 490			220
60A		260	380 (2) 555			200
61		90 (2) 232	150			320 (2) 424
62		150	200			800
63		960		1, 000		350
64		1, 700		980 (2) 713		300
65		350		160		850
			Long Key			
69	1, 250		280			1, 000
70	590		200 (2) 260			760
71		90	300			700 (2) 833
72	150			120		1, 150
73	50 (2) 284			520		360
74	(1)			620 (2) 292		1, 030
75	150			200	N. A.	
79	200			(1)	N. A.	
83		1, 350	N. A.		N. A.	
86		3, 100 (2) 1, 743	N. A.		N. A.	
88		780	N. A.		N. A.	

NOTES: (1) No change.
(2) Net average change for bracketed reach.
N. A. Not available.

88. 1950 to 1979. Comparison of the 12- and 18-foot depth contours of Honeymoon and Caladesi Islands is not possible due to the limited offshore portion of the profile lines. The 6-foot depth contour line off Honeymoon Island, as shown in table A-14 both advanced and receded, but no conclusions can be reached due to the limited data. The 6-foot depth contour off Caladesi advanced seaward a net average of 83 feet for the northern two-thirds of the island and receded landward a net average of 130 feet for the southern one third of the island, over the period 1974-1977. In the reach off Clearwater Beach, the 6-foot depth contour receded a net average of 458 feet. Data is not available for the 12- and 18-foot depth contour. In the reach off Sand Key, the 6-, 12-, and 18-foot depth contour receded net averages of 78, 200, and 210 feet, respectively, except at Maderia Beach where the 6-foot depth contour advanced a net average of 65 feet. Offshore of Treasure Island the 6-foot depth contour advanced a net average of 190 feet, while the 12-foot depth contour receded a net average of 344 feet. Profile data is not available for the 18-foot depth contour for either Treasure Island or Long Key. The 6- and 12-foot depth contours of Long Key advanced net averages of 128 and 286 feet, respectively.

VOLUMETRIC ACCRETION AND EROSION

89. The quantities presented in table A-15 are based on comparative profiles prepared from surveys, the dates of which are as follows: 1950 and 1979 for Clearwater Beach Island, Sand Key and Treasure Island; 1950 to 1978 for Long Key; 1974 to 1979 for Honeymoon Island; and 1974 to 1977 for Caladesi Island. The average annual net change for Honeymoon and Caladesi Islands was 15,200 cubic yards of erosion and 15,100 cubic yards of accretion, respectively. The average annual net change for Clearwater Beach Island was 27,200 cubic yards of accretion. The average annual net change for Sand Key was 88,300 cubic yards of erosion. However, as can be seen on Figure A-3, the erosion rate over the midsection of the island is higher than indicated due to placement of emergency fill during this period. The overall average is reduced due to the large accumulation north or the anchor groin at Johns Pass. The average annual net change at Treasure Island was 11,800 cubic yards of accretion. This accresion is due to a large extent by the construction and nourishment associated with the Treasure Island segment of the Pinellas County Beach Erosion Control project since 1969. The average annual net change for Long Key was 46,600 cubic yards of accretion. The accumulation of sand at the south end of Long Key is due to the groin at Pass-a-Grille Pass. Local interests placed 75,000 cubic yards of material at the north end of the island in 1975. Since the 1979 survey was taken, the Long Key segment of the Federal beach erosion control project has been constructed. Complete details of all fill material placed on Pinellas County beaches is provided in the main text.

90. Long Key. The Department of Natural Resources (DNR) 1974 and 1983 beach profile surveys, and the Corps of Engineers (CE) 1950 and 1978 surveys were utilized in determining volumetric changes, erosion or accretion rates, along the shore. For comparative purposes the DNR and the CE profiles were measured to a depth of -5 feet m.s.l. due to limitations of the 1974 DNR survey. Plate A-1 shows the locations of the DNR and CE profile lines.

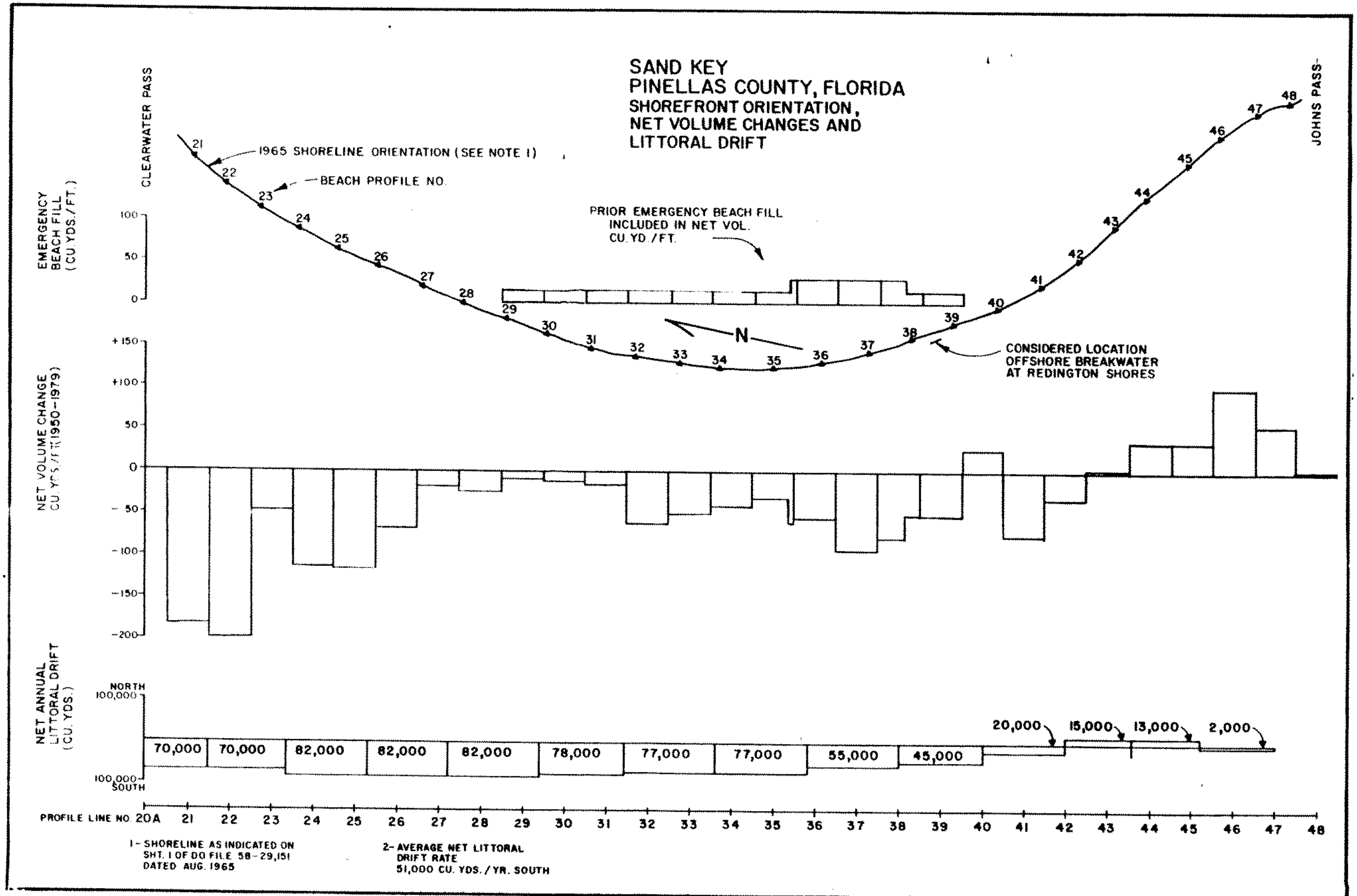

SAND KEY
PINELLAS COUNTY, FLORIDA
SHOREFRONT ORIENTATION, NET VOLUME CHANGES AND LITTORAL DRIFT
CLEARWATER PASS
JOHNS PASS
1965 SHORELINE ORIENTATION (SEE NOTE 1)
BEACH PROFILE NO.
PRIOR EMERGENCY BEACH FILL INCLUDED IN NET VOL. CU. YD./FT.
N
CONSIDERED LOCATION OFFSHORE BREAKWATER AT REDINGTON SHORES
EMERGENCY BEACH FILL (CU. YDS./FT.)
NET VOLUME CHANGE CU. YDS./FT.(1950-1979)
NET ANNUAL LITTORAL DRIFT (CU. YDS.)
NORTH 100,000
100,000 SOUTH
70,000
70,000
82,000
82,000
82,000
78,000
77,000
77,000
55,000
45,000
20,000
15,000
13,000
2,000
PROFILE LINE NO. 20A
1- SHORELINE AS INDICATED ON SHT. 1 OF DO FILE 58-29,151 DATED AUG. 1965
2- AVERAGE NET LITTORAL DRIFT RATE 51,000 CU. YDS./YR. SOUTH

FIGURE A-4

TABLE A-14

Offshore Depth Changes
1950 to 1979

Profile	6-foot contour Advance	6-foot contour Recession	12-foot contour Advance	12-foot contour Recession	18-foot contour Advance	18-foot contour Recession
			(feet)			
Honeymoon Island (1974-1979)						
R-1		15		N.A.		N.A.
R-3	30			N.A.		N.A.
R-4		N.A.		N.A.		N.A.
R-5		N.A.		N.A.		N.A.
R-7		N,A.		N.A.		N.A.
R-8		N.A.		N.A.		N.A.
R-9		80		40		N.A.
R-10	100			N.A.		N.A.
R-11	70			N.A.		N.A.
R-12		40		N.A.		N.A.
R-13		N.A.		N.A.		N.A.
R-14		N.A.		N.A.		N.A.
R-15		20		N.A.		N.A.
Caladesi Island (1974-1977)						
R-16		45				
R-17		(1)	50			N.A.
R-18	180		N.A.			N.A.
R-19	70		N.A.			N.A.
R-20	30		N.A.			N.A.
R-21	10		N.A.			N.A.
R-22	N.A.		N.A.			N.A.
R-23	N.A.		N,A.			N.A.
R-24	N.A.		N.A			N.A.
R-25	130		N.A.			N.A.
R-26	80		N.A.			N.A.
R-27		100	N.A.			N.A.
R-28		N.A.	N.A.			N.A.
R-29		130	N.A.			N.A.
R-30		240	N.A.			N.A.
R-31		50	N.A.			N.A.

TABLE A-14 (Cont'd)

Offshore Depth Changes
1950 to 1979

Profile	6-foot contour		12-foot contour		18-foot contour	
	Advance	Recession	Advance	Recession	Advance	Recession
			(feet)			
			Clearwater Beach Island			
2		N.A.		N.A.		N.A.
3		1,540		N.A.		N.A.
4		100		N.A.		N.A.
5		110		N.A.		N.A.
6		N.A.		N.A.		N.A.
8	220			N.A.		N.A.
10	250		115			N.A.
13	N.A.			N.A.		N.A.
15		400		N.A.		N.A.
16		140		N.A.		N.A.
			Sand Key			
20A		N.A.		N.A.		N.A.
21		60		620		N.A.
22		300		430		N.A.
23		10		160	340	100
24		120		140		250
25		135		120		330
26		90		60		420 (2) 210
27		45		30		270
28		45	30	(2) 162		20
29		(1)		20		80
30		20	20			
31		(1)		(1)		N.A.
32		20		80		N.A.
33	10			150		N.A.
34		60		200		N.A.
35		20		100		N.A.
36		50		N.A.		
37		50		300		
38		90 (2) 78		240		
39		90		300		
40	10		80			
41		205		N.A.		
42		20		320		
43		50		N.A.		
44	25			140		
45	50		35			
46	115 (2) 65		250			
47	70			N.A.		
48				N.A.		

TABLE A-14 (Cont'd)

Treasure Island

58			350	N.A.				N.A.
59			580	N.A.				N.A.
60A	300					100		N.A.
61	190	(2) 190		180				N.A.
62	50					300	(2) 344	N.A.
63	130					400		N.A.
64	280					550		N.A.
65			210			370		N.A.

Long Key (1950 to 1978

69			830	N.A.				N.A.
70			60	350	(2) 286			N.A.
71	300			300				N.A.
72	130			250				N.A.
73	30	(2) 128		80				N.A.
74	30			450				N.A.
75	(1)			N.A.				N.A.
79	150			N.A.				N.A.
83		N.A.		N.A.				N.A.
86		N.A.		N.A.				N.A.
88		N.A		N.A.				N.A

NOTES: (1) No change.
(2) Net average change for bracketed reach.
N.A. Not available.

TABLE A-15

Volumetric Accretion and Erosion
(1,000 cubic yards)

Profile	Total Net Change		Average Annual Change		Net Annual Change (1)
	Accretion	Erosion	Accretion	Erosion	
			Honeymoon Island (1974-1979)		
R-1	9.7	61.5	1.9	12.3	-10.4
R-3	39.4	21.1	7.9	4.2	+3.7
R-4	-	32.3	-	6.5	-6.5
R-5	1.6	2.2	.3	.4	-.1
R-7	-	4.9	-	1.0	-1.0
R-8	3.8	20.1	.8	4.0	-3.2
R-9	47.7	32.9	9.5	6.6	+2.9
R-10	24.2	4.8	4.8	1.0	+3.8
R-11	7.9	3.5	1.6	.7	+.9
R-12	2.9	21.4	.6	4.3	-3.7
R-13	18.3	12.7	3.7	2.5	+1.2
R-14	.6	11.0	.1	2.2	-2.1
R-15	4.6	7.9	.9	1.6	-.7
Total	160.7	236.3	32.1	47.3	-15.2
			Caladesi Island (1974-1977)		
R-16	21.7	25.6	7.2	9.5	-2.3
R-17	27.0	19.8	9.0	6.6	+2.4
R-18	15.0	36.4	5.0	12.1	-7.1
R-19	17.2	3.8	5.7	1.3	+4.4
R-20	17.2	13.5	5.7	4.5	+1.2
R-21	3.0	5.2	1.0	1.7	-.7
R-22	5.3	3.8	1.8	1.3	+.5
R-23	3.5	7.3	1.2	2.4	-1.2
R-24	2.6	20.8	.9	6.9	-6.0
R-25	49.3	7.3	16.4	2.4	+14.0
R-26	56.3	.7	18.8	.2	+18.6
R-27	32.7	9.1	10.9	3.0	+7.9
R-28	15.2	2.9	5.1	1.0	+4.1
R-29	39.5	57.1	13.2	19.0	-5.8
R-30	12.2	65.0	4.1	21.7	-17.6
R-31	8.8	.7	2.9	.2	+2.7
Total	326.5	279.0	108.9	93.8	+15.1

(Continued)

TABLE A-15 (Cont'd)

Profile	Total Net Change Accretion	Total Net Change Erosion	Average Annual Change Accretion	Average Annual Change Erosion	Net Annual Change (1)
		Clearwater Beach Island (1950-1979)			
3	168.5	478.6	5.8	16.5	-10.7
4	285.0	54.9	9.8	1.9	+7.9
5	207.4	198.5	7.2	6.8	+.4
8	632.6	10.1	21.8	.3	+21.5
10	340.4	-	11.7	-	+11.7
13	105.3	34.6	3.6	1.2	+2.4
15	27.6	166.2	1.0	5.7	-4.7
16	14.8	52.7	.5	1.8	-1.3
Total	1,881.6	995.6	61.4	34.2	+27.2
		Sand Key (1950-1979)			
20A		NA		NA	-8.6
21		345.1		11.9	-11.9
22		472.7		16.3	-16.3
23		113.1		3.9	-3.9
24		275.5		9.5	-9.5
25		295.8		10.2	-10.2
26		182.7		6.3	-6.3
27		55.1		1.9	-1.9
28		60.9		2.1	-2.1
29		23.2		.8	- .8
30		29.0		1.0	-1.0
31		37.7		1.3	-1.3
32		66.7		2.3	-2.3
33		84.1		2.9	-2.9
34		121.8		4.2	-4.2
35		95.7		3.3	-3.3
36		139.2		4.8	-4.8
37		217.5		7.5	-7.5
38		159.5		5.5	-5.5
39		147.9		5.1	-5.1
40	81.2		2.8		+2.8

(Continued)

TABLE A-15 (Cont'd)

Profile	Total Net Change		Average Annual Change		Net Annual
	Accretion	Erosion	Accretion	Erosion	Change (1)
Sand Key (Cont'd)					
41		214.6		7.4	-7.4
42		89.9		3.1	-3.1
43	0			0	0
44	101.5		3.5		+3.5
45	92.8		3.2		+3.2
46	258.1		8.9		+8.9
47	136.3		4.7		+4.7
48	2.9		.1		+ .1
Total	672.8	3,233.5	23.2	111.5	-88.3
Treasure Island (1950-1979)					
58	96.5	389.9	3.3	13.8	-10.5
59	266.0	327.5	9.2	11.3	-2.1
60	660.0	16.2	22.8	.6	+22.2
61	245.1	165.4	8.5	5.7	+2.8
62	122.6	123.6	4.2	4.3	-.1
63	114.1	104.6	3.9	3.6	+.3
64	230.9	103.5	8.0	3.6	+4.4
65	38.4	187.6	1.3	6.5	-5.2
Total	1,773.6	1,418.3	61.2	49.4	+11.8
Long Key (1950-1978)					
69	-	296.4	-	10.2	-10.2
70A	395.1	32.0	13.6	1.1	+12.5
71	437.9	-	15.1	-	+15.1
72	365.7	-	12.6	-	+12.6
73	297.5	-	10.3	-	+10.3
74	319.9	11.1	11.0	.4	+10.6
75	71.3	16.8	2.5	.6	+1.9
79	86.1	20.8	3.0	.7	+2.3
83	137.6	-	4.7	-	+4.7
Total	2,111.1	377.1	72.8	13.0	+59.8

NOTES: (1) Minus sign indicates erosion; plus sign indicates accretion.

TABLE A-16

SUMMARY VOLUMETRIC ACCRETION
LONG KEY

	COE 1950-1978	DNR 1974-1983
North Cell - Profile	69-71	145-153
Accretion Rate (cuyd/ft/yr)	2.7	1.6
Volume Change (cu.yd.)	+1,182,000	+448,000
Middle Cell - Profile	72-75	154-160
Accretion Rate (cuyd/ft/yr)	0.6	2.3
Volume Change (cu.yd.)	+172,000	+154,000
South Cell - Profile	79-86	162-166
Accretion Rate (cuyd/ft/yr)	0.2	2.8
Volume Change (cu.yd.)	+25,000	+120,000
Total Volume Change (cu. yd.)	+1,379,000	+722,000
Volume 1975 Beach Nourishment (cu. yd.)	-75,000	-75,000
Volume 1979 Beach Nourishment (cu. yd.)	--	-240,000
	+1,304,000	+407,000
Average Volume Change per Year (cu. yd.)	+46,600	+45,200
Average Accretion Rate per Year (cuyd/ft/yr)	2.1	2.1

91. Two beach nourishment projects took place within the time span of the profile comparisons. In 1975 the city of St. Petersburg sponsored a 75,000-cubic-yard beach nourishment extending 2,250 feet south from Blind Pass at the north end of Long Key. In 1979, the Corps of Engineers constructed a 240,000-cubic-yard beach nourishment project consisting of 150,000 of beach fill extending 2,200 feet south from Blind Pass, and a 90,000-cubic-yard offshore bar also at the north end of Long Key. In order to obtain an accurate erosion or accretion rate, these beach nourishment quantities were subtracted from the quantities obtained from the profile comparisons.

92. Both the CE and the DNR surveys showed an over all average accretion rate of 2.1 cu.yd/ft/yr for the Long Key shoreline. However, two erosion areas were depicted by the survey data, one at profile CE-75 with an erosion rate of 0.5 cu.yd/ft/yr and the other at DNR-162 with an erosion rate of 0.3 cu.yd/ft/yr. These profiles are located 16,500 and 17,600 feet respectively south of Blind Pass inlet. The survey data also indicates a definite southward littoral transport of beach nourishment material and the erosion area at the south end of Long Key.

93. The 1975 beach nourishment had moved south alongshore from the placement location about 4,500 feet by 1978 to profile CE-71 (DNR-150). By 1983 the 1975 beach nourishment had moved south alongshore an additional 3,000 feet to DNR-152 and 154. The 1979 beach nourishment material had moved about 2,000 feet south of the placement area to DNR-146 and 148 by 1983.

94. The shoreline was segmented into three cells on the basis of accretion or erosion rates. The CE survey was segmented as follows: north cell - profile 69 thru 71; middle cell - profiles 72 thru 74; and south cell - profiles 75 thru 86. The shorefront lengths associated with these reaches are: 7.167 feet, 8,017 feet, and 7,183 feet, respectively. The DNR survey was segmented as follows: north cell - profiles 145 thru 153; middle cell - profiles 154 thru 160; and south cell - profiles 162 thru 166. The shorefront lengths associated with these reaches are: 9,264 feet, 7,540 feet, and 4,790 feet, respectively. Table A-16 lists the accretion rate for each cell.

95. Review of Corps of Engineers surveys showed that between 1873 and 1950 the shoreline at the south end of Long Key, specifically at CE profile 86, about 300 feet north of the groin, has a recession of 200 feet. Between 1959 and 1960, a rubble-mound groin was built at Pass-A-Grille by the city of St. Petersburg at a cost of $23,000. In 1962, the groin was extended at a cost of $36,500. By 1978, surveys showed an accretion rate of 0.13 cu.yd/ft/yr and by 1983 the accretion rate had increased to 2.7 cu.yd/ft/yr at profile 86. This reversal of erosion to accretion and the actual increase in the accretion rate between 1978 and 1983 was attributed to the construction of the groin.

PERIODIC NOURISHMENT REQUIREMENTS

86. Future nourishmnent requirements can be estimated from past losses. In this particular case, due to the effect of fill and structures provided by the various municipalities, future nourishment requirements were based only in part on the losses shown in table A-15. The nourishment requirements for the alternative plans of improvement were based on the computed losses plus an allowance of fill to offset the artificial fill made by local interests and by the Corps in construction of the Pinellas County beach erosion control project and maintenance dredging of the adjacent navigation projects, which reduced the computed losses. Future nourishment requirements, by island segment, are discussed in the following paragraphs.

87. For the period 1974 to 1979, the surveyed erosion rate for Honeymoon Island was 15,200 cubic yards annually. This rate was rounded to 15,000 cubic yards annually for future nourishment estimates.

88. For the period 1974 to 1979, the shoreline of Caledesi Island accreted 15,000 cubic yards annually. However, the mean high water shoreline receeded 9.2 feet per year over the same period. This shoreline recession rate closely match the rate of retreat for Honeymoon Island (7.5 feet per year). Future nourishment of the adjacent southern island (Clearwater Beach Island) is estimated at 10,000 cubic yards annually. Therefore, the future nourishment rate for Caledesi Island is estimated to be 10,000 cubic yards per year.

89. For the period 1950 to 1979, Clearwater Beach Island experienced 27,200 cubic yards accretion annually. However, for the same period, the southern .5 mile of the island eroded 105,800 cubic yards. In addition, in 1979, 215,000 cubic yards of material was placed in this problem area by local interests. The equivalent erosion rate for the southern .5 mile of the island would then be 11,100 cubic yards of erosion annually. Therefore future nourishment requirements for Clearwater Beach Island are estimated at 10,000 cubic yards annually.

90. For the period 1950 to 1979, the surveyed erosion rate for Sand Key (14.2 miles) was 88,300 cubic yards annually. The expected nourishment rate required for the 7.3 mile problem area on Sand key is 56,000 cubic yards annually.

91. For the period 1950 to 1979, the surveyed accretion and erosion for Treasure Island was 1,773,600 and 1,418,300 cubic yards, respectively. In addition, 1,450,000 cubic yards of fill material were placed on Treasure Island from 1969 thru 1978 by the Corps of Engineers. This is equivalent to an erosion rate of 37,700 cubic yards per year. When considering the amount of fill placed after 1969 and thru 1983 (860,000 cubic yards) the erosion rate for this 14-year period would be 61,400 cubic yards annually. This rate is somewhat higher than is now occuring due to the construction of two groins at the southern end of Treasure Island by the Corps of Engineers in 1976. Therefore, future nourishment requirements for Treasure Island are estimated to be 50,000 cubic yards annually.

92. For the period 1950 to 1978, the northern 3,000 feet of Long Key eroded 296,400 cubic yards. In addition, locals placed 75,000 cubic yards of fill material in the same area in 1975. This totals 371,400 cubic yards, or 12,800 cubic yards per year of erosion. In 1979, 240,000 cubic yards of material was placed in the northern 2,800 feet at Long Key by the Corps of Engineers. By the end of 1984, all of the fill material had eroded. The loss rate for the period 1979 to 1984 would be 48,000 cubic yards. This higher loss rate is expected to continue to the forseeable future. Therefore, future nourishment requirements for Long Key are estimated to be 50,000 cubic yards annually.

93. For the period 1964 to 1971, the gulf and bay shorelines of Mullet Key eroded at a rate of 30,000 cubic yards annually. This rate was used to estimate future nourishment requirements.

94. Estimates by island segments and for reaches considered for restoration and/or nourishment, are summarized as follows:

Honeymoon Island----------------	15,000	cubic yards annually
Caladesi Island-----------------	10,000	Do.
Clearwater Beach Island---------	10,000	Do.
Sand Key------------------------	56,000	Do.
Treasure Island-----------------	50,000	Do.
Long Key------------------------	50,000	Do.
Mullet Key----------------------	30,000	Do.

INCLOSURE 1

BEACH EROSION CONTROL STUDY

PINELLAS COUNTY, FLORIDA

1953

SUMMARY

1. Study. A beach erosion control study, of that portion of the Pinellas County gulf shore between Big Pass (now Dunedin Pass) and Pass-a-Grille Pass, was made by the Corps of Engineers in cooperation with the Board of County Commissioners under the provisions of Section 2, of the River and Harbor Act approved July 3, 1930, as amended and supplemented. The study was completed in 1953, a report on which was published as House Document No. 380, 83d Congress, 2d session.

2. Purpose of the study was to determine the best method or methods of:

a. Preventing further recession of the gulf shoreline.

b. Stabilizing the gulf shores of Big, Little, Johns, Blind, and Pass-a-Grille Passes.

c. Widening the beach along the midportion of Clearwater Beach, south portion of Sand Key, middle and south portions of Treasure Island, and along the frontages of St. Petersburg and Pass-a-Grille Beaches.

3. Findings of the study showed the problem to be primarily one of recession and erosion of the beach caused by storm waves and currents. The problem areas were chiefly in the middle and southerly portions of Clearwater Beach Island, Sand Key, Treasure Island, and Long Key. The islands were highly developed and considerable damage was experienced due to beach erosion.

4. Authorized project. A beach erosion control project for the shores of Pinellas County was authorized by Congress on 3 September 1954. The plan of improvement authorized is shown on figure A-1 and described briefly below. Details are in House Document No. 380, 83d Congress, 2d session. The project was placed in the inactive category in 1961.

5. The plan of improvement authorized by Congress provides for: (a) artificial placement of sand to form a protective beach generally 60 feet wide between mean high water and a bulkhead line along 1.96 miles and 0.16 mile of shore on Clearwater Beach Island, 12.54 miles on Sand Key, 1.75 miles on Treasure Island, and 1.34 miles and 1.20 miles on Long Key, to be

replenished by periodic nourishment; and (b) provision of treated water timber grons at the northerly edges of Little Pass (Clearwater Pass), Johns Pass, Blind Pass, and Pass-a-Grille.

6. Estimates of costs. The first costs of the considered plan of protection, by islands, for both offshore and bay dredging for beach fill and for the groins are summarized below.

Island	First Costs Assuming * Offshore Dredging	First Costs Assuming * Bay Dredging
Clearwater Beach	$242,400	$168,700
Sand Key	410,600	276,400
Treasure Island	174,600	118,700
Long Key	115,800	89,400
Total	$943,400	$653,200

*Based on 1954 price level.

Bay dredging at a cost of $653,200 was recommended. The estimated annual costs were as follows on the next page.

7. Estimates of benefits were based on 1954 price levels converted to equivalent values on a long-term projected basis. Benefits were anticipated from the considered improvement in the form of direct damages prevented, increased property values resulting from shore protection, and recreational benefits. Total benefits (based on 1954 price levels and projected to reflect future changes in price levels) are summarized below.

Agency	Clearwater Beach Island	Sand Key	Treasure Island	Long Key	Total Benefit
Federal	$ 0	$ 300	$ 0	$ 0	$ 300
Non-Federal public	9,800	5,700	2,800	10,100	28,400
Private	51,500	104,700	26,800	23,600	216,200
Total	$61,300	$110,700	$39,200	$33,700	$244,900

8. Cost apportionment. Cost-sharing between the Federal Government and local interests was made in accordance with Federal law and policy existing at that time. In 1954, the Federal policy for the expenditure of Federal funds for the improvement and protection of shores owned by states, municipalities, and other political subdivisions was set forth in Public Law 727, 79th Congress, 2d session. The maximum Federal aid under the provisions of Public Law 727 was deemed permissible. The Federal share of the cost was therefore 1/3 of the first cost of cosntruction applicable to the publicly-owned shore, plus the entire first costs of construction applicable to the federally-owned shore.

Bay dredging at a cost of $653,200 was recommended. The estimated annual costs were as follows:

Island	Agency						Total (Rounded)	
	Federal		Non-Federal Public		Private			
	Assuming offshore dredging	Assuming bay dredging	Assuming offshore dredging	Assuming bay dredging	Assuming offshore dredging	Assuming bay dredging	Assuming offshore dredging	Assuming bay dredging
Clearwater Beach Island----------------	$ 495	$ 345	$ 3,135	$2,265	$15,825	$11,400	$ 19,500	$14,000
Sand Key----------------	725	500	3,010	2,115	50,040	35,030	53,800	37,600
Treasure Island---------	105	70	630	445	12,400	8,745	13,100	9,300
Long Key----------------	545	420	5,630	4,245	9,295	7,020	15,500	11,700
Total (rounded)--------	$1,900	$1,300	$12,400	$9,100	$87,600	$62,200	$101,900	$72,600

INCLOSURE 2

BEACH EROSION CONTROL STUDY

PINELLAS COUNTY, FLORIDA

1966

SUMMARY

1. Study. A beach erosion control study covering the gulf shore of Pinellas County from Dunedin Pass (formerly Big Pass) to Pass-a-Grille Pass and adjacent shores was made by the Corps of Engineers in cooperation with the Pinellas County Board of County Commissioners in response to resolutions adopted by the Senate Public Works Committee and House Public Works Committee on 19 June 1963 and 27 November 1963, respectively. The study was completed in 1966 and published as HD 519/89/2.

2. Purpose of the Study. The study was intended to survey the shores of Pinellas County with a view to:

a. Reexamine the cause of the erosion problem and the plan of protection authorized by Congress in 1954, with recommendations for such modifications thereby as may be required;

b. Determine the current economic justification of the selected plan of improvement; and,

c. Determine the divison of project cost between local interest and Federal Government based on the current conditions of shore ownership and existing law.

3. Findings of the Study. Reexamination showed:

a. The problem in Pinellas County is one of erosion and lowering of the beach profile where protected by seawalls, and recession of the shoreline where unprotected by seawalls. A plan of improvement was recommended as discussed below.

b. The estimate of total first cost of the improvements is \$3,040,000 and annual cost of \$284,200, including \$162,700 for beach nourishment. Estimated annual benefits total \$483,200 for an overall benefit-cost ratio of 1.5.

c. The estimated Federal share of the first cost is \$116,400 and of periodic nourishment, \$15,300 annually for the first 10 years of the project life, based on current estimates of shore ownership.

4. Authorized Project. A beach erosion control project for the shores of Pinellas County was authorized by Congress on the plan of improvement as authorized is shown on figure A-2 and described briefly below. Details are in HD 519/89/2.

5. The plan of improvement authorized by Congress provides for:

a. Restoration and nourishment of 5,000 feet of shore on Clearwater Beach Island;

b. Restoration and nourishment of 49,000 feet of shore on Sand Key;

c. Restoration and nourishment of 9,200 feet of shore on Treasure Island;

d. Nourishment of 5,600 feet of shore on Long Key;

e. Construction of 600 feet of stone revetment for protection of the publicly-owned hotel building on Long Key; and,

f. Periodic nourishment for each segment as required.

6. Estimates of Costs. The first costs of the considered plan of protection based on 1965 price levels are summarized below, by island.

Location	Item		Amount
Clearwater Beach Island-------	Beach restoration		$ 206,000
Do--------------------	Revetment	(1)	304,000
Sand Key----------------------	Beach restoration		2,255,000
Treasure Island---------------	do.		515,000
Long Key----------------------	Revetment		64,000
Total---		(2)	$3,344,000

NOTES: (1) Not subject to apportionment
(2) Amount subject to apportionment is $3,344,000 - $304,000, or $3,040,000.

7. Estimates of benefits. Benefits anticipated are in the form of direct damages prevented, benefits from prevention of loss of land, and benefits from enhancement of property values. Although recreational usage of the beaches in the study area is substantial, no recreational benefits are claimed from the considered improvements due to the fact that ample public beach area exists at locations other than those recommended for restoration. Estimates of monetary benefits are based on fall 1965 price level, and are summarized in table A-1. There are no Federal benefits anticipated from the considered improvements.

TABLE A-1

SUMMARY OF ANNUAL BENEFITS

Type of Benefit	Non-Federal public	Private	Total
CLEARWATER BEACH ISLAND (Beach restoration and nourishment)			
Direct damages prevented----------	$ 4,200	$ 29,200	$ 33,400
(Revetment)			
Direct damages prevented---------	1,100	7,400	8,500
Prevention of loss of land-------	0	7,700	7,700
Enhancement of property values---	0	19,800	19,800
Total---------------------------	1,100	34,900	36,000
SAND KEY			
Direct damages prevented---------	1,300	226,700	228,000
Enhancement of property values---	0	14,600	14,600
Total---------------------------	1,300	241,300	242,600
TREASURE ISLAND			
Direct damages prevented---------	20,600	39,700	60,300
Enhancement of property values---	0	73,400	73,400
Total---------------------------	20,600	113,100	133,700
LONG KEY			
Direct damages prevented---------	28,500	0	22,500
Enhancement of property values---	0	0	6,000
Total---------------------------	28,500	0	28,500
Total entire area----------------	$36,500	$437,700	$474,200

8. Apportionment of costs. The policy of Federal aid in the restoration and protection of shores against erosion is set forth in Public Law 826, 84th Congress, as amended and supplemented by Public Law 87-874 of the River and Harbor Act of October 23, 1962. Under that law, Federal participation in the cost of construction of protective works along publicly-owned shores is authorized up to one-half of the cost, except in the cases of certain parks and conservation areas. Privately-owned shores are eligible for Federal aid if there is benefit such as that arising from public use or from the protection of nearby property, or if the benefits to the shores are incidental to the project, and the Federal contribution to the project is adjusted in accordance with the degree of such benefits. First costs and annual costs of the plan of improvement were apportioned between Federal and non-Federal interests and are summarized in table A-2. Table A-2 shows the cost apportionment based on existing conditions of shore ownership.

TABLE A-2

SUMMARY OF COST APPORTIONMENT
ANNUAL COST

Island	Agency Apportionment 1/					
	Federal		Non-Federal		Total	
	Percent	Amount	Percent	Amount	Percent	Amount
Clearwater Beach Island	5.9 (revetment not included)	$ 1,600	94.1	$ 40,900	100	$ 42,500
Sand Key	1.9	3,000	98.1	153,000	100	156,000
Treasure Island	5.7	4,500	94.3	74,000	100	78,500
Long Key	50.0	10,900	50.0	114,000	100	22,300
Total (rounded)	-	$ 20,000	-	$279,300	100	$299,300

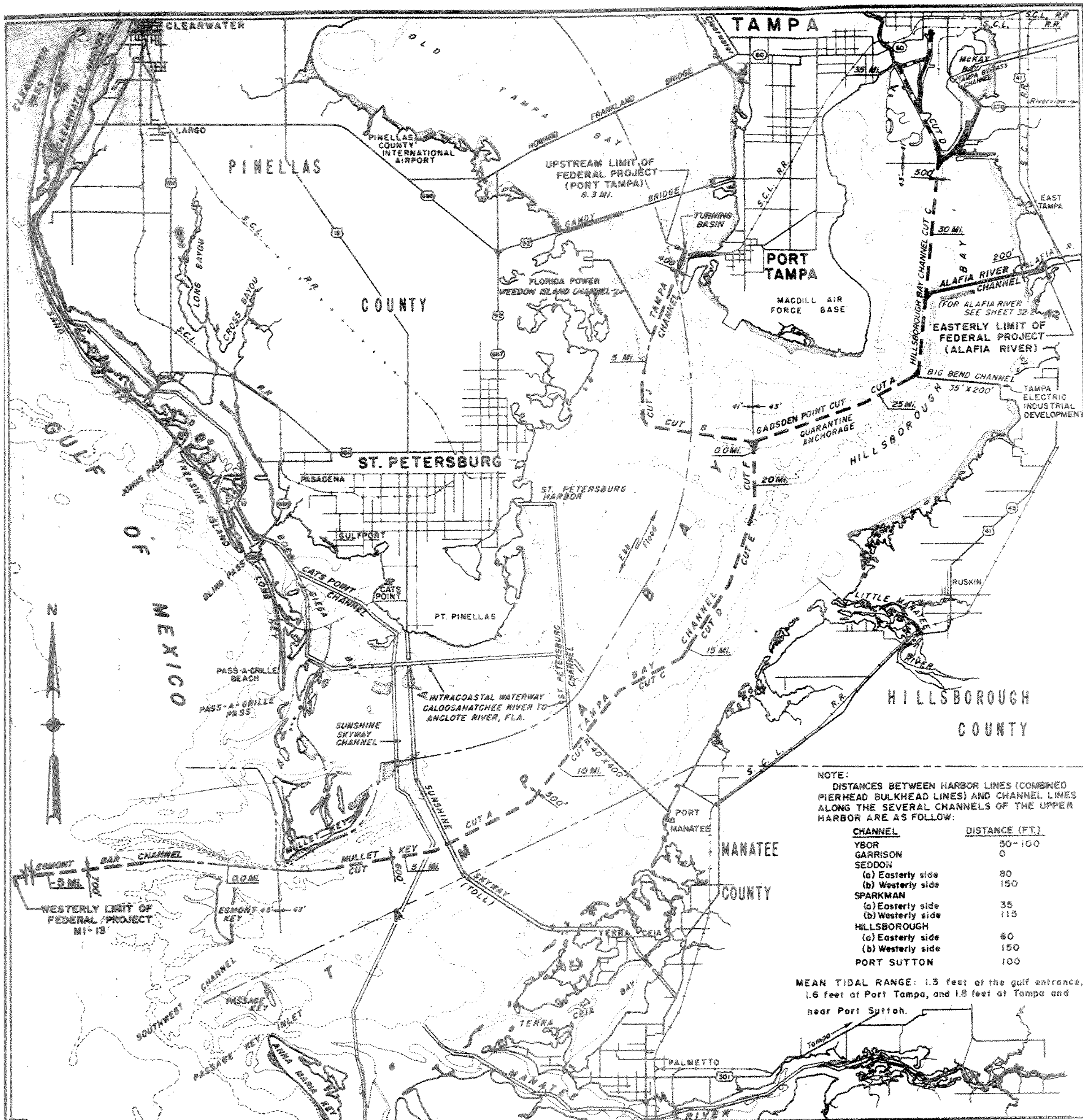
1/ Based on 1966 legislation.

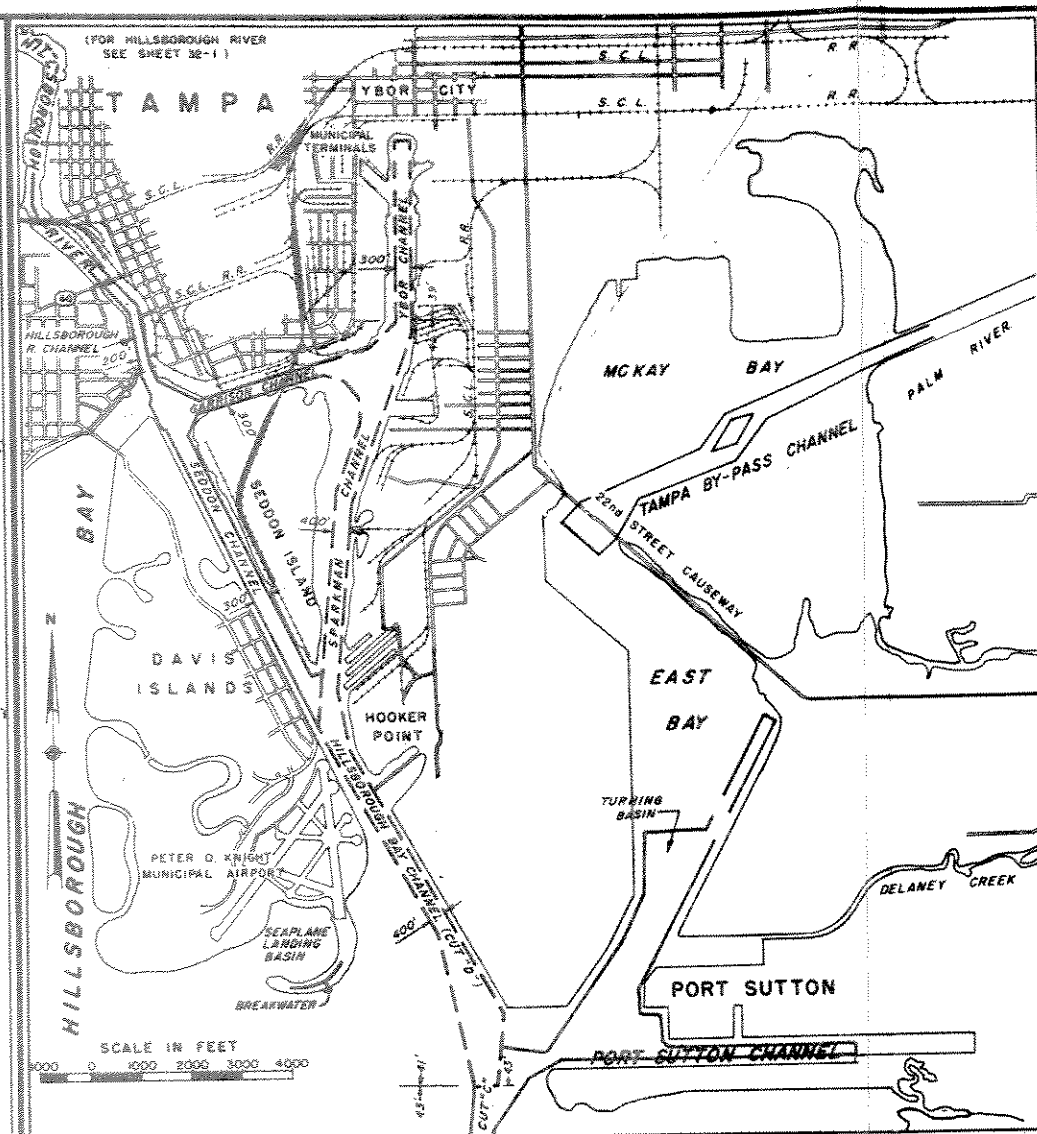
PROJECT MAPS

FOR

EXISTING FEDERAL

PROJECTS

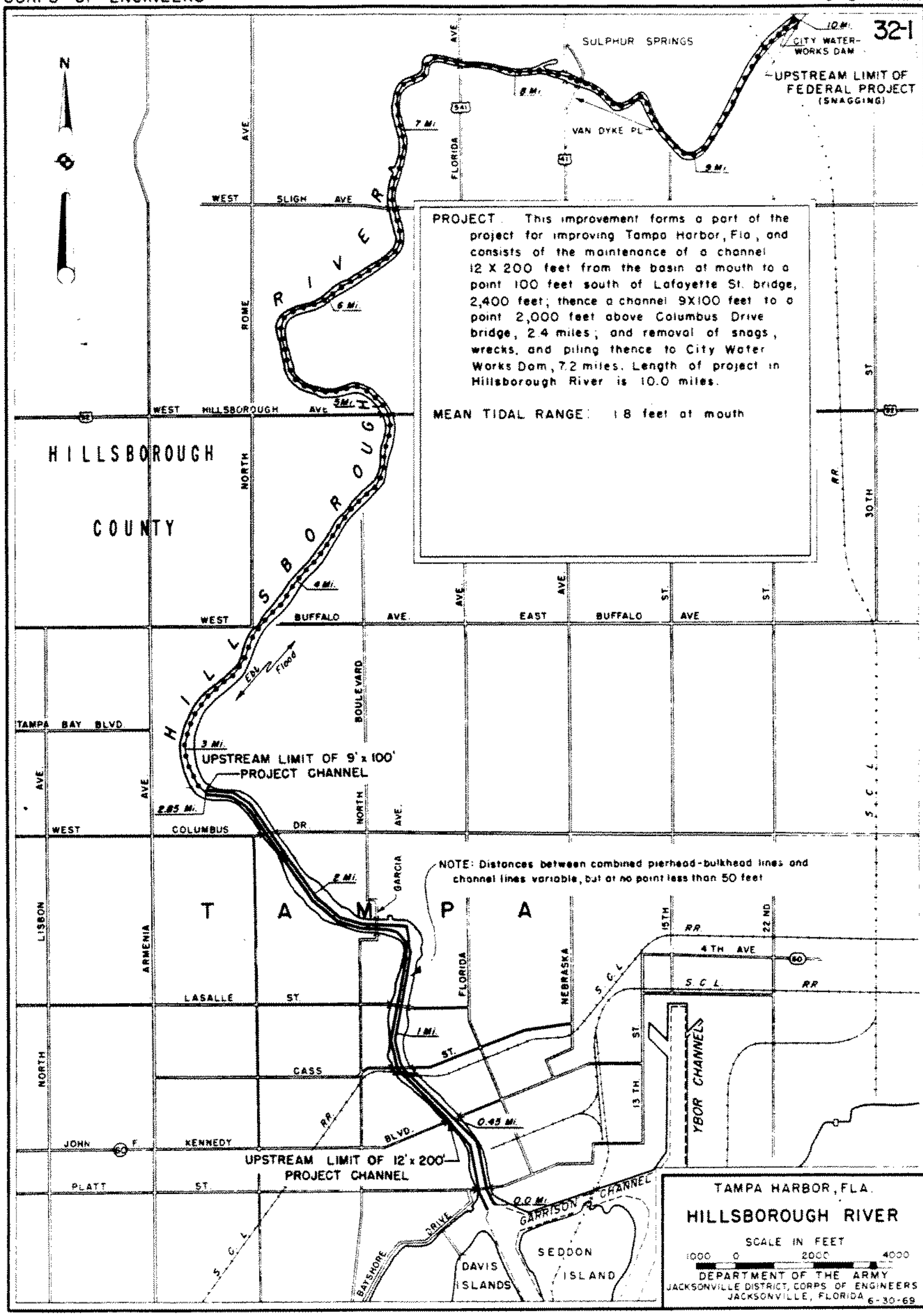


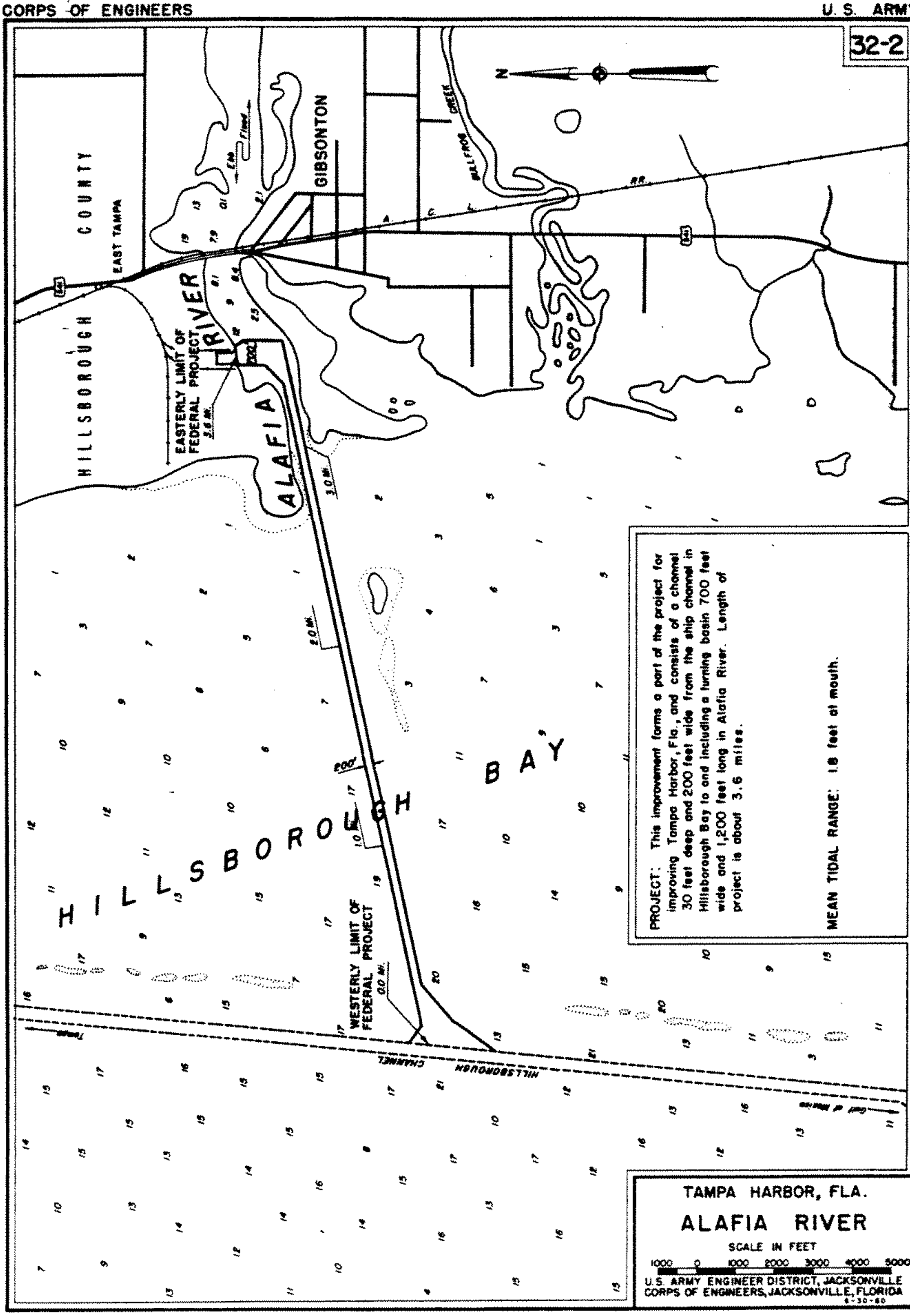


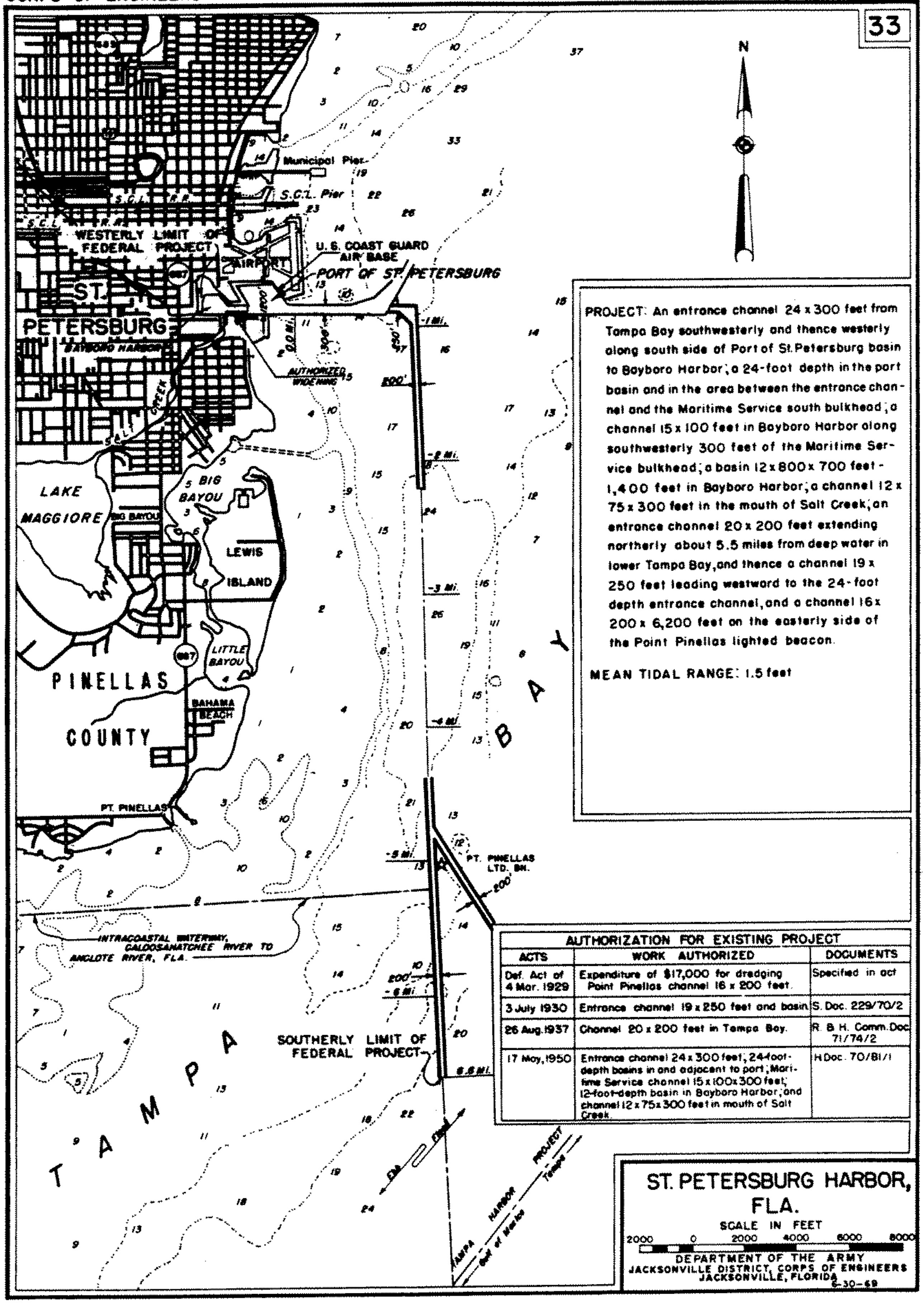
ACT	AUTHORIZATION FOR EXISTING PROJECT — WORK AUTHORIZED	DOCUMENTS
	TAMPA HARBOR (CONTINUED)	
31 DEC. 1970	42 feet deep, 2,000 feet long, and 900 feet wide; Port Sutton entrance channel 44 X 400 feet; Port Sutton turning basin 44 feet deep with turning diameter of 1,200 feet; enlargement of turning basin at the entrance of Ybor Channel and deepening to 42 feet; East Bay entrance channel 44 X 400 and 500 feet about 2,000 feet North from Port Sutton turning basin; East Bay turning basin 44 feet deep with a 1,200 foot turning diameter; East Bay approach channel 44 X 300 feet about 2,500 feet North from the East Bay turning basin; and maintenance of Port Sutton terminal channel to 44 X 200 feet for a distance of 4,000 feet. Bottom 1 foot of all project segments in "inactive" category.	H. DOC. 91-401/91/2

PROJECT: Bottom 1 foot of
category. Channel from Gulf to
43 X 600 feet in Mullet Key
Bay to the junction of Hills
Hillsborough Bay Channel f
junction with Port Sutton e
existing width to the juncti
and Garrison Channels, wide
Bay Channel by 250 feet; a
involving cutting back north
Sutton entrance channel, a
feet; 41 X 400 feet in Spar
turning basin at the entranc
of 200 feet on the Southwe
Channel, and 41 X 900 X 2,0
East Bay entrance channel
feet; a turning basin in Eas
approach channel 43 X 300
2,500 feet; maintenance of
wide and 4,000 feet long; ar
basin at mouth to a point
of a channel 9 X 100 feet to
removal of snags, wrecks, and pil
feet from Hillsborough Ba
River, 3.6 miles; and a br
feet long, maintenance by
and about 3,000 feet long,
depth of 30 feet; Length
River, 3.6 miles in Alafia

ACT	
3 Mar. 1899	Channel 27 X 300-500
3 Mar. 1905	Channel depth of 26
25 JUNE 1910	Depth of 24 feet in
8 Aug. 1917	Channels 27 X 200-5 at mouth of Hillsbor
3 Mar. 1899	Channel 12 X 200 fee only).
22 Sept. 1922	Consolidation of abo
3 July 1930	Egmont Channel 29
30 Aug. 1935	Egmont Bar Channel channels in Tampa H basin at Port Tampa
20 June 1938	Widen bend between 250 feet; Ybor Chann easterly 300 feet.
20 June 1938	Breakwater at Peter
2 Mar. 1945	Sparkman and Ybor westerly 250 feet, feet.
2 Mar. 1945	Channel 9 X 100 feet Florida Ave. bridge.
2 Mar. 1945	Channel 25 X 150 fe
17 May 1950	Egmont Channel 36 borough Bay, Port T 34 X 750 X 2,000 fe deep, and channel 3 feet in Alafia Rive
3 Sept. 1954	Removal of obstructi Water Works Dam (m
23 Oct. 1962	Channel and turning deep and 400 fee
31 Dec. 1970	Egmont Bar Channel Bay Channel 44 X 5 Channels; Hillsborou entrance channel, th Channels; Sparkma Port Tampa Channe Tampa Bay Channe


32-1
PROJECT. This improvement forms a part of the project for improving Tampa Harbor, Fla., and consists of the maintenance of a channel 12 X 200 feet from the basin at mouth to a point 100 feet south of Lafayette St. bridge, 2,400 feet; thence a channel 9X100 feet to a point 2,000 feet above Columbus Drive bridge, 2.4 miles; and removal of snags, wrecks, and piling thence to City Water Works Dam, 7.2 miles. Length of project in Hillsborough River is 10.0 miles.
MEAN TIDAL RANGE: 1.8 feet at mouth
NOTE: Distances between combined pierhead-bulkhead lines and channel lines variable, but at no point less than 50 feet
CITY WATER-WORKS DAM
UPSTREAM LIMIT OF FEDERAL PROJECT (SNAGGING)
SULPHUR SPRINGS
VAN DYKE PL
UPSTREAM LIMIT OF 9' x 100' PROJECT CHANNEL
UPSTREAM LIMIT OF 12' x 200' PROJECT CHANNEL
HILLSBOROUGH RIVER
HILLSBOROUGH COUNTY
TAMPA
Ebb
Flood
10 Mi.
9 Mi.
8 Mi.
7 Mi.
6 Mi.
5 Mi.
4 Mi.
3 Mi.
2.85 Mi.
2 Mi.
1 Mi.
0.45 Mi.
0.0 Mi.
WEST SLIGH AVE
WEST HILLSBOROUGH AVE
WEST BUFFALO AVE
EAST BUFFALO AVE
TAMPA BAY BLVD.
WEST COLUMBUS DR.
LASALLE ST
CASS ST.
JOHN F. KENNEDY BLVD.
PLATT ST.
4TH AVE
ROME AVE.
NORTH AVE.
NORTH BOULEVARD
FLORIDA AVE.
NEBRASKA AVE.
LISBON AVE.
ARMENIA AVE.
GARCIA
15TH ST.
22 ND ST.
30TH ST.
13 TH ST.
BAYSHORE DRIVE
GARRISON CHANNEL
YBOR CHANNEL
DAVIS ISLANDS
SEDDON ISLAND
S. C. L.
RR
TAMPA HARBOR, FLA.
HILLSBOROUGH RIVER
SCALE IN FEET
1000 0 2000 4000
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
6-30-69


32-2
N
GIBSONTON
HILLSBOROUGH COUNTY
EAST TAMPA
BULLFROG CREEK
A.C.L. RR.
41
ALAFIA RIVER
EASTERLY LIMIT OF FEDERAL PROJECT
3.6 MI.
3.0 MI.
2.0 MI.
1.0 MI.
0.0 MI.
200'
WESTERLY LIMIT OF FEDERAL PROJECT
HILLSBOROUGH BAY
HILLSBOROUGH CHANNEL
PROJECT: This improvement forms a part of the project for improving Tampa Harbor, Fla., and consists of a channel 30 feet deep and 200 feet wide from the ship channel in Hillsborough Bay to and including a turning basin 700 feet wide and 1,200 feet long in Alafia River. Length of project is about 3.6 miles.
MEAN TIDAL RANGE: 1.6 feet at mouth.
TAMPA HARBOR, FLA.
ALAFIA RIVER
SCALE IN FEET
1000 0 1000 2000 3000 4000 5000
U.S. ARMY ENGINEER DISTRICT, JACKSONVILLE
CORPS OF ENGINEERS, JACKSONVILLE, FLORIDA
6-30-60



PROJECT: An entrance channel 24 x 300 feet from Tampa Bay southwesterly and thence westerly along south side of Port of St. Petersburg basin to Bayboro Harbor; a 24-foot depth in the port basin and in the area between the entrance channel and the Maritime Service south bulkhead; a channel 15 x 100 feet in Bayboro Harbor along southwesterly 300 feet of the Maritime Service bulkhead; a basin 12 x 800 x 700 feet - 1,400 feet in Bayboro Harbor; a channel 12 x 75 x 300 feet in the mouth of Salt Creek; an entrance channel 20 x 200 feet extending northerly about 5.5 miles from deep water in lower Tampa Bay, and thence a channel 19 x 250 feet leading westward to the 24-foot depth entrance channel, and a channel 16 x 200 x 6,200 feet on the easterly side of the Point Pinellas lighted beacon.

MEAN TIDAL RANGE: 1.5 feet

AUTHORIZATION FOR EXISTING PROJECT

ACTS	WORK AUTHORIZED	DOCUMENTS
Def. Act of 4 Mar. 1929	Expenditure of $17,000 for dredging Point Pinellas channel 16 x 200 feet.	Specified in act
3 July 1930	Entrance channel 19 x 250 feet and basin.	S. Doc. 229/70/2
26 Aug. 1937	Channel 20 x 200 feet in Tampa Bay.	R. & H. Comm. Doc. 71/74/2
17 May, 1950	Entrance channel 24 x 300 feet; 24-foot-depth basins in and adjacent to port; Maritime Service channel 15 x 100 x 300 feet; 12-foot-depth basin in Bayboro Harbor; and channel 12 x 75 x 300 feet in mouth of Salt Creek.	H. Doc. 70/81/1

ST. PETERSBURG HARBOR, FLA.

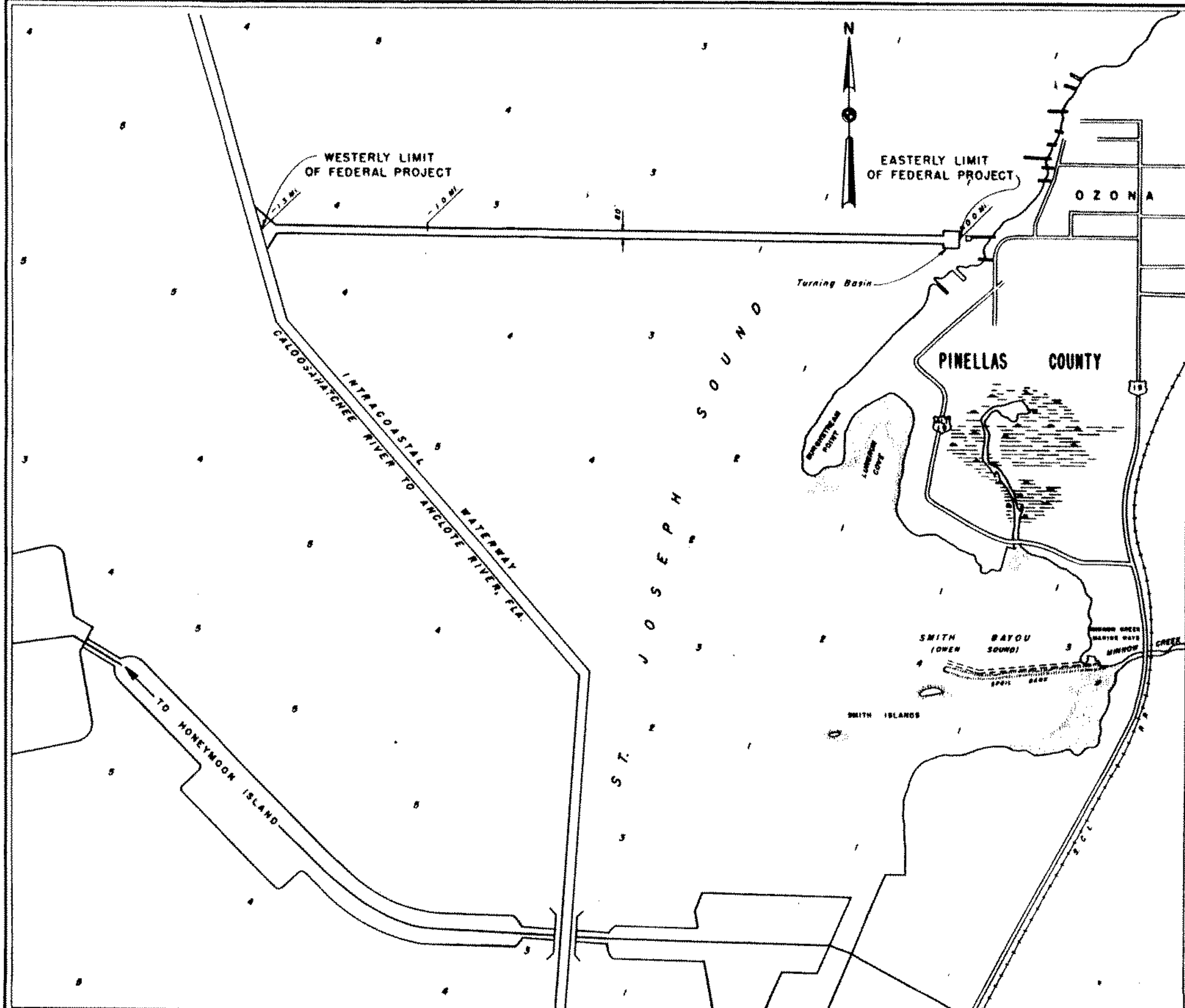
SCALE IN FEET

2000 0 2000 4000 6000 8000

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
6-30-69

CORPS OF ENGINEERS

U.S. ARMY



34

PROJECT: A channel 6 feet deep and 80 feet wide from the Intracoastal Waterway, Caloosahatchee River to Anclote River, to the head of the Ozona Fish Co. pier, with a turning basin 6 feet deep and 150 feet square at the latter location. The length of the improvement is about 1.3 miles.

MEAN TIDAL RANGE: 1.8 feet at Ozona.

AUTHORIZATION FOR EXISTING PROJECT		
ACT	WORK AUTHORIZED	DOCUMENT
17 May 1950	Channel 6'X80' and turning basin 6'X150'X150'	H. DOC 326/81/1

OZONA, FLA.
CHANNEL AND TURNING BASIN

SCALE IN FEET

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

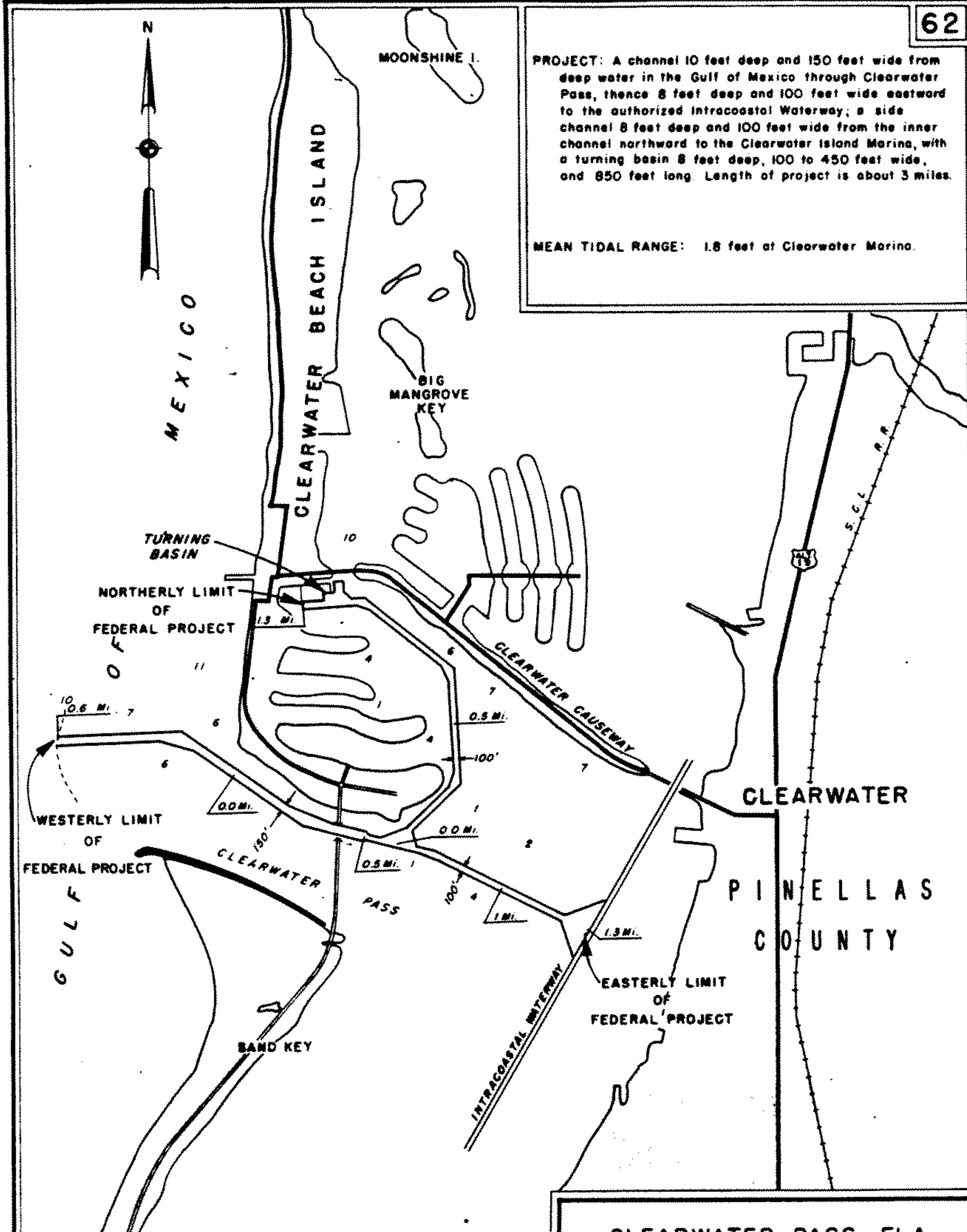
6-30-87

CORPS OF ENGINEERS U.S. ARMY

62

PROJECT: A channel 10 feet deep and 150 feet wide from deep water in the Gulf of Mexico through Clearwater Pass, thence 8 feet deep and 100 feet wide eastward to the authorized Intracoastal Waterway; a side channel 8 feet deep and 100 feet wide from the inner channel northward to the Clearwater Island Marina, with a turning basin 8 feet deep, 100 to 450 feet wide, and 850 feet long. Length of project is about 3 miles.

MEAN TIDAL RANGE: 1.8 feet at Clearwater Marina.



AUTHORIZATION FOR EXISTING PROJECT		
ACT	WORK AUTHORIZED	DOCUMENT
14 July 1960	Entrance channel 10 by 150 feet, inside channels 8 by 100 feet, and a turning basin	H. Doc. 293/86/2

CLEARWATER PASS, FLA.

SCALE IN FEET

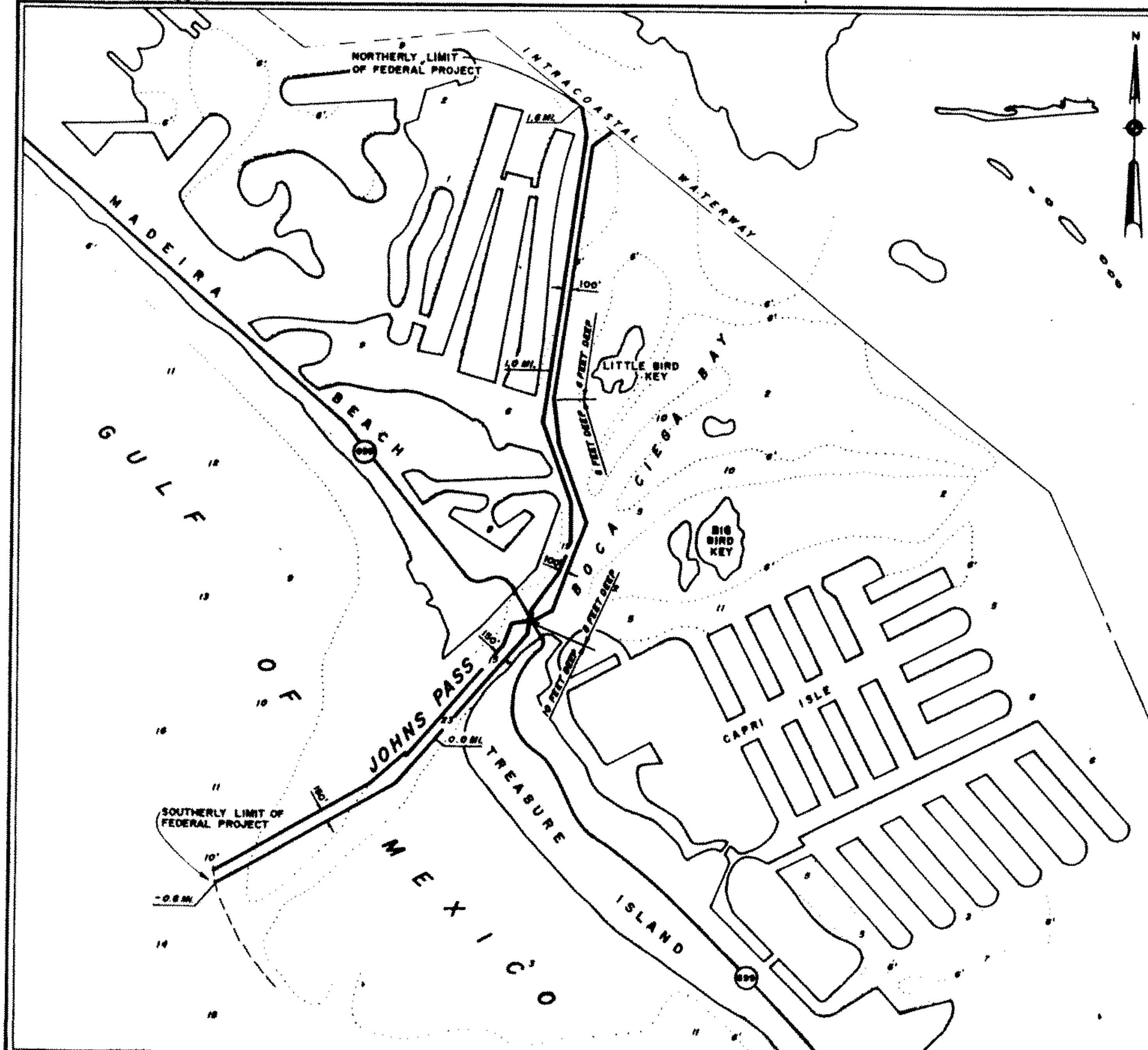
1000 0 1000 2000 3000 4000

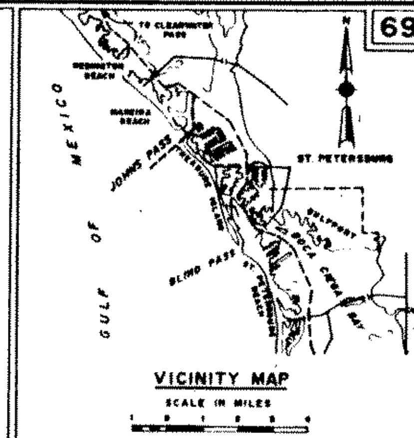
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA 9-30-79

CORPS OF ENGINEERS

U. S. ARMY

69





VICINITY MAP

SCALE IN MILES

PROJECT: Provide and maintain an entrance channel at Johns Pass 10 feet deep by 150 feet wide across the gulf bar, thence 8 feet deep by 100 feet wide into the pass, thence 6 feet deep by 100 feet wide to the Intracoastal Waterway. Length of project is about 2.2 miles.

MEAN TIDAL RANGE. About 1.5 feet.

AUTHORIZATION FOR EXISTING PROJECT

ACT	WORK AUTHORIZED	DOCUMENT
14 July 1960 (1)	Entrance channel at Johns Pass 10 X 150 feet across the gulf bar, 8 X 100 feet into the pass, and 6 X 100 feet to the Intracoastal Waterway	

(1) Approved by the Chief of Engineers 2 December 1964 under Section 107.

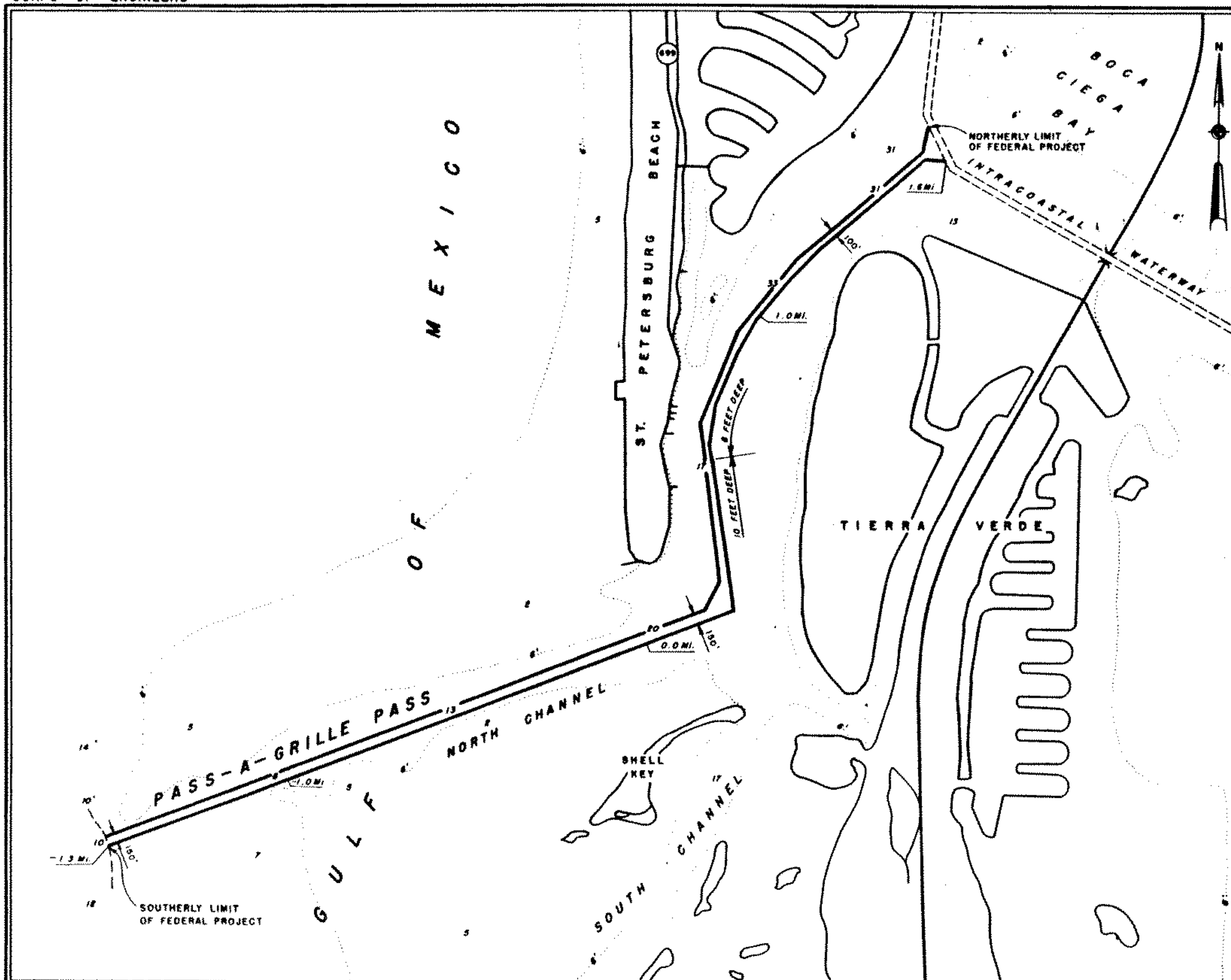
JOHNS PASS,
PINELLAS COUNTY, FLA.

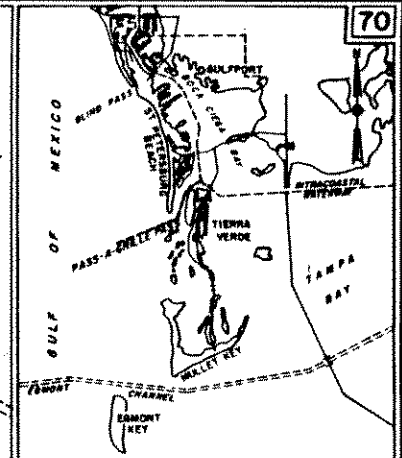
SCALE IN FEET

500 0 500 1000 1500

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

6-30-68





VICINITY MAP

SCALE IN MILES

PROJECT: Provide and maintain an entrance channel at Pass-a-Grille Pass 10 feet deep by 150 feet wide across the gulf bar, thence 8 feet deep by 100 feet wide to the Intracoastal Waterway. Length of project is about 2.9 miles.

MEAN TIDAL RANGE: About 1.5 feet.

AUTHORIZATION FOR EXISTING PROJECT

ACT	WORK AUTHORIZED	DOCUMENT
14 July 1960 (1)	Entrance channel at Pass-a-Grille Pass 10 X 150 feet across the gulf bar and 8 X 100 feet to the Intracoastal Waterway	—

(1) Approved by the Chief of Engineers 17 July 1964 under Section 107.

PASS-A-GRILLE PASS, PINELLAS COUNTY, FLA.

SCALE IN FEET

500 0 500 1000 1500

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

6-30-66

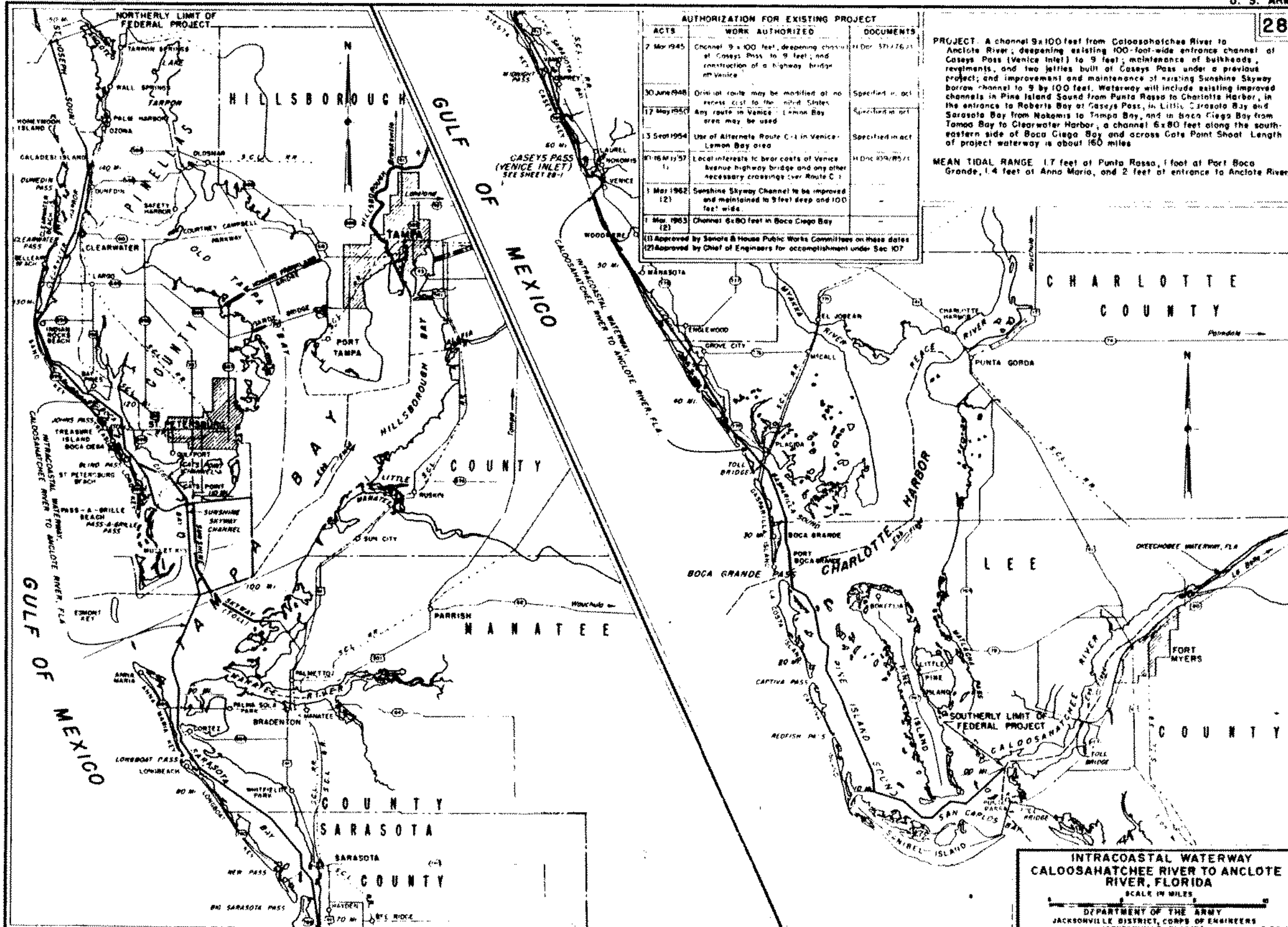
PROJECT. A channel 9x100 feet from Caloosahatchee River to Anclote River; deepening existing 100-foot-wide entrance channel at Caseys Pass (Venice Inlet) to 9 feet; maintenance of bulkheads, revetments, and two jetties built at Caseys Pass under a previous project; and improvement and maintenance of existing Sunshine Skyway borrow channel to 9 by 100 feet. Waterway will include existing improved channels in Pine Island Sound from Punta Rassa to Charlotte Harbor, in the entrance to Roberts Bay at Caseys Pass, in Little Sarasota Bay and Sarasota Bay from Nokomis to Tampa Bay, and in Boca Ciega Bay from Tampa Bay to Clearwater Harbor; a channel 6x80 feet along the southeastern side of Boca Ciega Bay and across Cats Point Shoal. Length of project waterway is about 160 miles.

MEAN TIDAL RANGE. 1.7 feet at Punta Rassa, 1 foot at Port Boca Grande, 1.4 feet at Anna Maria, and 2 feet at entrance to Anclote River.

AUTHORIZATION FOR EXISTING PROJECT

ACTS	WORK AUTHORIZED	DOCUMENTS
2 Mar 1945	Channel 9 x 100 feet, deepening channel at Caseys Pass to 9 feet; and construction of a highway bridge at Venice.	H Doc 371/76/1
30 June 1948	Original route may be modified at no excess cost to the United States.	Specified in act
17 May 1950	Any route in Venice - Lemon Bay area may be used	Specified in act
3 Sept 1954	Use of Alternate Route C-1 in Venice-Lemon Bay area	Specified in act
10-16 May '57 (1)	Local interests to bear costs of Venice Avenue highway bridge and any other necessary crossings over Route C-1	H Doc 109/85/1
1 Mar 1962 (2)	Sunshine Skyway Channel to be improved and maintained to 9 feet deep and 100 feet wide.	-
1 Mar. 1963 (2)	Channel 6x80 feet in Boca Ciega Bay	-

(1) Approved by Senate & House Public Works Committees on these dates
(2) Approved by Chief of Engineers for accomplishment under Sec 107



INTRACOASTAL WATERWAY
CALOOSAHATCHEE RIVER TO ANCLOTE RIVER, FLORIDA
SCALE IN MILES
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
6-30-68

BEACH EROSION CONTROL REVIEW STUDY
PINELLAS COUNTY, FLORIDA

APPENDIX B

PLAN FORMULATION AND EVALUATION

Information concerning plan formulation and evaluation is covered in detail in the main report. An effect assessment in contained herein to supplement the information in the main text. Adequate description of the detailed plans are contained in the main text and will not be repeated in this appendix.

EFFECT ASSESSMENT

An effect assessment carried out in terms of the detailed plans contribution to the four accounts of NED, EQ, RED, and OSE was made. This assessment was summarized in Table 11 of the main report. A more detailed assessment is found on Table B-1. The final selected plan is a modification of the alternatives included on this table.

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
A. Plan Description	Without project do nothing.	Non-Stuctural combination plan including • Zoning & building code modification • Establish Erosion Control Line (ECL) • Comply with flood insurance program	Initial beach fill along 9.6 miles of shore with periodic nourishment along 35.1 miles of shore
B. Significant Impacts			
shore			
1. National Economic Development (NED)			
a. Beneficial Impacts			
(1) Storm and wave damage	-	-	$ 8,372,000
(2) Recreation	-	-	6,104,000
Total	-	-	$14,476,000
b. Adverse Impacts			
(1) Projects First Costs	Undetermined	Minimal	$27,650,000
(2) Annual Charges	Undetermined	Minimal	4,166,000
c. B/C Ratio	Undetermined	-	3.5
2. Environmentally Quality (EQ)			
a. Beneficial Impacts			
(1) Manmade Resources	None	Reduce development in coastal area, thereby reducing future storm & wave damage.	Protect existing and future structures from storm and wave damage.
(2) Natural Resources*	None	Limits effect of future development on beach.	Stabilize existing beach and creates new beach.

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
(3) Air Quality*	No Change	No Change	None
(4) Water Quality*	No Change	No Change	None
(5) Ecosystem	None	None	Reestablish upland beach habitat lost to erosion.
(6) Physical Aspect	None	Reduce future erosion losses	Stabilize beach & reduce erosion losses.
b. Adverse Impacts			
(1) Manmade* Resources	Storm and wave damage to existing & future structures.	Storm and wave damage to existing structures.	None
(2) Natural Resources*	Loss of existing beach.	Loss of existing beach.	Temporary disruption to beach area during construction and periodic nourishment.
(3) Air Quality*	No Change	No Change	Temporary decrease during construction and maintenance and due to increased beach use.

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
(3) Air Quality*	No Change	No Change	None
(4) Water Quality*	No Change	No Change	Temporary decrease due to construction & periodic nourishment.
(5) Ecosystem	Continued loss of upland beach area.	Continued loss of upland beach area.	Temporary disruption to food chain and benthic habitat in fill and borrow areas.
(6) Physical Aspect	Continued erosion	Continued erosion	None
3. Regional Economic Developement (RED)			
a. Beneficial Impacts			
(1) Tax Revenues*	Negligible	Negligible	Increased recreation may generate more spending and tax revenue.
(2) Property Values*	Negligible	Negligible	Increased storm protection may enhance shoreline property values.
(3) Land Use	None	Rezoning may enhance land use in coastal area.	Negligible

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
(4) Public Facilities*	None	None	Protection of public facilities from erosion and wave damage
(5) Public Services*	Negligible	Negligible	May increase with increased tax revenue and increased recreational demand to beaches.
(6) Regional Growth	Negligible	Negligible	Increased recreational use would enhance local economy and trade.
(7) Employment*	Negligible	Negligible	Increased recreational use may enhance related employment opportunities. Construction & nourishment will increase employment opportunities.
(8) Business Industrial Activity*	Negligible	Negligible	Increased recreational use may enhance related business opportunities.
(9) Displacement of Farms*	None displaced	None displaced	None displaced

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
b. Adverse Impacts			
(1) Tax Revenues*	Loss of beach activities could decrease tax revenues.	Same as no-action	Negligible
(2) Property Values*	Continued erosion may reduce value of shoreline property.	Same as no-action only less due to future effects being less.	Negligible
(3) Land Use	Reduced land use with continued erosion.	Same as no-action only less due to future effects being less.	Negligible
(4) Public Facilities*	Continued erosion threaten existing facilities.	Same as no-action	Temporary disruption during construction & periodic nourishment.
(5) Public Services*	Minor loss of tax revenue may decrease services.	Same as no-action	Negligible
(6) Regional Growth*	Minor, some growth may be affected.	Same as no-action	Negligible

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
(7) Employment*	Minor, some loss with loss of recreational beach.	Same as no-action.	Negligible
(8) Business Industrial Activity*	Loss of recreational bech would affect related commerce & erosion could cause some relocation.	Same as no-action.	Negligible
(9) Displacement of Farms*	None	None	None
4. Other Social Effects (OSE)			
a. Beneficial Impacts			
(1) Noise*	Negligible	Negligible	Negligible
(2) Displacement of People*	None	Evacuation planning and zoning changes would decrease potential for future displacement of people.	Protective beach would decrease potential for loss of nearshore development and resulting displacement of people.

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
(3) Esthetics*	Negligible	Negligible	Increase with wide sandy beach.
(4) Housing	Negligible	Negligible	Negligible
(5) Archeological & Historical Structures	Negligible	Negligible	Negligible
(6) Leisure Opportunities	None	None	Increased recreational beach would enhance leisure activities.
(7) Community Cohension*	Negligible	Negligible	Provision of a layer of beach and less concern for storm & wave damage would enhance community spirit.
(8) Community Growth*	Negligible	Negligible	Minor
(9) Health and Safety*	Negligible	Increase with new zoning, building codes and evacuation planning.	Protective beach would increase safety and well being of shoreline occupants.

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
b. Adverse Impacts			
(1) Noise*	None	None	Temporary increase during construction and periodic nourishment and with larger beach crowds.
(2) Displacement of People*	Continued erosion may result in displacement of shoreline residents.	Same as no-action only less.	Negligible
(3) Esthetics*	Minor, erosion damage effects.	Minor, erosion damage effects.	Minor, reduced during construction & nourishment.
(4) Housing	Erosion damage may cause loss of housing.	Same as no-action.	Minor, shoreline housing may be converted to recreational beach related development.
(5) Archeological & Historical Structures.	Continued erosion may damage undiscovered archeological sites located on shoreline.	Same as no-action.	Nourishment may cover undiscovered archeological sites, unless proper procedures are taken.

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
(6) Leisure Opportunities	Continued erosion reduces recreational beach potential.	Same as no-action.	Negligible
(7) Community Cohension*	Negligible	Negligible	Negligible
(8) Community Growth*	Minor, loss of some growth due to erosion threat.	Same as no-action.	Negligible
(9) Health and Safety*	Continued erosion increases threat to safety of shoreline residents.	Same as no-action. only somewhat less.	Negligible
C. Plan Evaluation			
1. Contribution to Planning Objectives.			
a. Reduce Damages.	None	Reduces future damages by an undetermined amount.	Reduces damages by $7,905,000 annually.

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
b. Provide Recreational Beach	None	None	Provides additional acres of recreational beach.
c. Erosion Control	None	None	Provides stabilized shoreline along 35.1 miles.
d. Protect Tourist Trade	None	None	Enhance tourist-based recreational beach.
e. Coastal Zone	None	Protects coastal zone through adoption of	Establishes new beach through adoption of ECL, etc.
2. Relationsip to Four National Accounts			
a. NED.	Adverse-erosion	Adverse - same as no-action.	Beneficial - erosion damages reduced and beach recreation demand fulfilled. Net benefits of $10,310,000.
b. EQ.	Adverse-loss of beach and structures due to storm & wave damage.	Minor enhancement associated with non-structural plan.	Beneficial - protection of property, creation of beach and new upland habitat, stabilization of shore outweigh adverse impacts which are largely temporary.

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
c. RED	Adverse due to continued erosion and associated losses.	Adverse due to continued erosion & associated losses.	Beneficial Increased recreational use enhances all elements of RD.
d. OSE	Adverse minor due to loss of recreation potential.	Minor enhancement associated with non-structural changes.	Beneficial positive impacts due to creation of protective and recreational beach.
3. Response to Evaluation Criteria			
a. Acceptability	Not acceptable to local interest.	Acceptable in conjunction with a structural alternative.	Supported by local interests, F&WL and EPA with restrictions on borrow areas.
b. Completness	NA	Plan depends on adoption & enforcement of regulations.	Plan depends on periodic nourishment to assure realization of benefits.
c. Effectiveness	NA	Plan would not be effective without implementation of some type structural remedy.	Plan would reduce erosion damage increase recreation potential.

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
d. Efficiency	NA	Plan depends on adoption & enforcement of regulations.	Plan depends on periodic nourishment to assure realization of benefits.
4. Implementation Responsibilities			
a. Federal First Cost	-	None	
(1) Honeymoon Island			$ 574,000
(2) Clearwater Beach Island			523,500
(3) Sand Key			12,477,500
(4) Long Key			414,000
(5) Total			$13,989,000
b. Federal Annual Cost	-	None	
(1) Honeymoon Island			159,600
(2) Caladesi Island			35,700

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
(3) Clearwater Beach Island			125,000
(4) Sand Key			1,305,100
(5) Treasure Island			168,500
(6) Long Key			196,000
(7) Mullet Key			156,800
(8) Total			$2,146,700
c. Other Items	-	None	Design, construct, and periodically nourish beach.
d. Non-Federal First Cost	-	100% of cost (expected to be minimal)	
(1) Honeymoon Island			$ 246,000
(2) Clearwater Beach Island			523,500
(3) Sand Key			12,477,500

TABLE B-1

SUMMARY COMPARISON OF ALTERNATIVE PLANS

Item	No Action	NS-12	S-2
(4) Long Key			414,000
(5) Total Non-Federal First Cost			$13,661,000
e. Non-Federal Annual Cost	-	100% of Cost	
(1) Honeymoon Island			$ 68,400
(2) Caldesi Island			15,300
(3) Clearwater Beach Island			125,000
(4) Sand Key			1,378,900
(5) Treasure Island			168,500
(6) Long Key			196,000
(7) Mullet Key			67,200
(8) Total			$2,019,300
f. Other Items	-	Establish ECL Implement other non-structural items.	Establish ECL operate & maintain periodically nourish provide parking & access

APPENDIX C

ENGINEERING INVESTIGATIONS AND DESIGN

BEACH EROSION CONTROL REVIEW STUDY
PINELLAS COUNTY, FLORIDA

APPENDIX C

ENGINEERING INVESTIGATIONS & DESIGN

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BEACH EROSION CONTROL REVIEW STUDY
PINELLAS COUNTY, FLORIDA

APPENDIX C

ENGINEERING INVESTIGATIONS & DESIGN

DESIGN FEATURES

1. This appendix presents significant information on design, construction, and operation as required for a reasonable understanding of the technical aspects of the beach fills considered in the final stage of the plan formulation process. A summary of the features for each of these alternatives is provided on table C-1 and discussed in the following paragraphs.

WATER LEVELS

2. The water level frequency relations used in this report were based on NOAA stage frequency curves for the Gulf coast of Florida. Figure C-1 shows the resultant total tide frequency curve on the open coast opposite Clearwater, Florida.

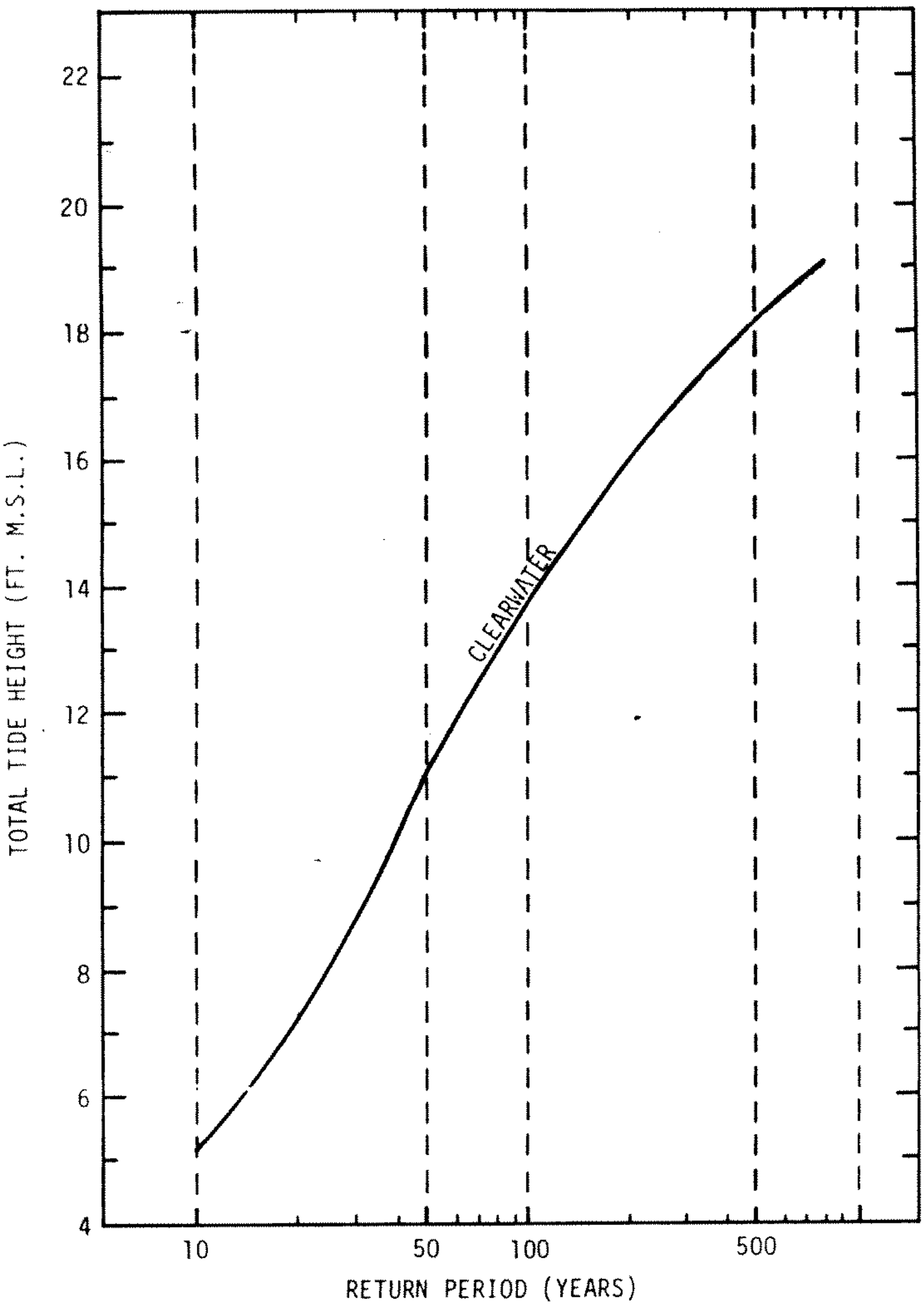
BEACH SLOPES

3. An evaluation of the foreshore and nearshore slopes for the completed segments of the Pinellas County BEC Project revealed that the average natural adjusted slopes from the berm to just below mean low water and from this location to the bottom intersect is respectively, 1 vertical to 20 horizontal and 1 vertical to 30 horizontal. Therefore, these slopes were used in the considered alternatives for volume computations and recreational benefit computation purposes.

SHORELINE RECESSION

4. During a storm, onshore waves gouge quantities of sand from the upland beach and dunes, and then deposit most of it offshore forming a sand bar. Given enough time, before the next severe storm, much of the material (80 to 90 percent) in the bar will return to the upland beach primarily due to wave action.

5. There are no known specific data relating shore erosion to storm surge levels and waves for the beaches in the study area. Therefore, the extent of erosion to be expected from storms of given intensity for the various considered alternatives was analytically determined in accordance with procedures developed by Edelman, T. Jr. (presented in chapter 46 of the proceedings of the 1968 Coastal Engineering Conference) and later revised by Vallianos.



TOTAL TIDE FREQUENCY CURVE ON THE OPEN COAST AT CLEARWATER, FLORIDA

FIGURE C-1

TABLE C-1

SUMMARY OF FEATURES OF VARYING DEGREES OF PROTECTION

Degree of Protection1/	Berm Dimensions (ft)		Dune Elv (ft. MLW)	Volume of Fill (1,000 cy)			Surge2/ Elv (ft. MLW)	Bluff Recession (ft)
	Width	Elv (MLW)		Honeymoon Island	Clearwater Beach Island	Sand Key		
9-Year	25	6.0	0				5.4	25
11-Year	40	6.0	0	85	92	2,350	6.3	40
15-Year	65	6.0	8.0	116	129	2,700	7.2	65
30-Year	100	6.0	10.0	192	214	3,545	9.9	100

1/ Return Interval of Surge.

2/ From NOAA Stage-frequency curve, converted to MLW.

6. This method is based on a mass balance approach and can predict a specific recession associated with a storm of a given frequency of occurrence, see figure C-2. However, during a storm the shoreline does not receed in a uniform manner, it is more likely, and indeed can be shown by empirical data[1/] that the amount of recession for different segments of the beach varies considerably. These data also indicate that it would be reasonable to define this variation about the mean as a normal probility curve with a standard deviation of about 1/2 the mean. The average is likely to be that recession predicted by the theoretical equations of Edelman. These values as related to the considered storm surges are summarized in the last column of table C-1.

7. Considering a mean recession of m feet, the probability of occurrence for a given recession of x feet is the area under the bell-shaped curve or the integral of this function. This integral is difficult to evaluate but has been evaluated and is available in tables for values of the standardized normal distribution where the Mean (m) is equal to 0. There is a transformation which can be applied to any normal distribution to standardize it. The equation is as follows:

$$z = \frac{x - m}{.5m}$$

where,

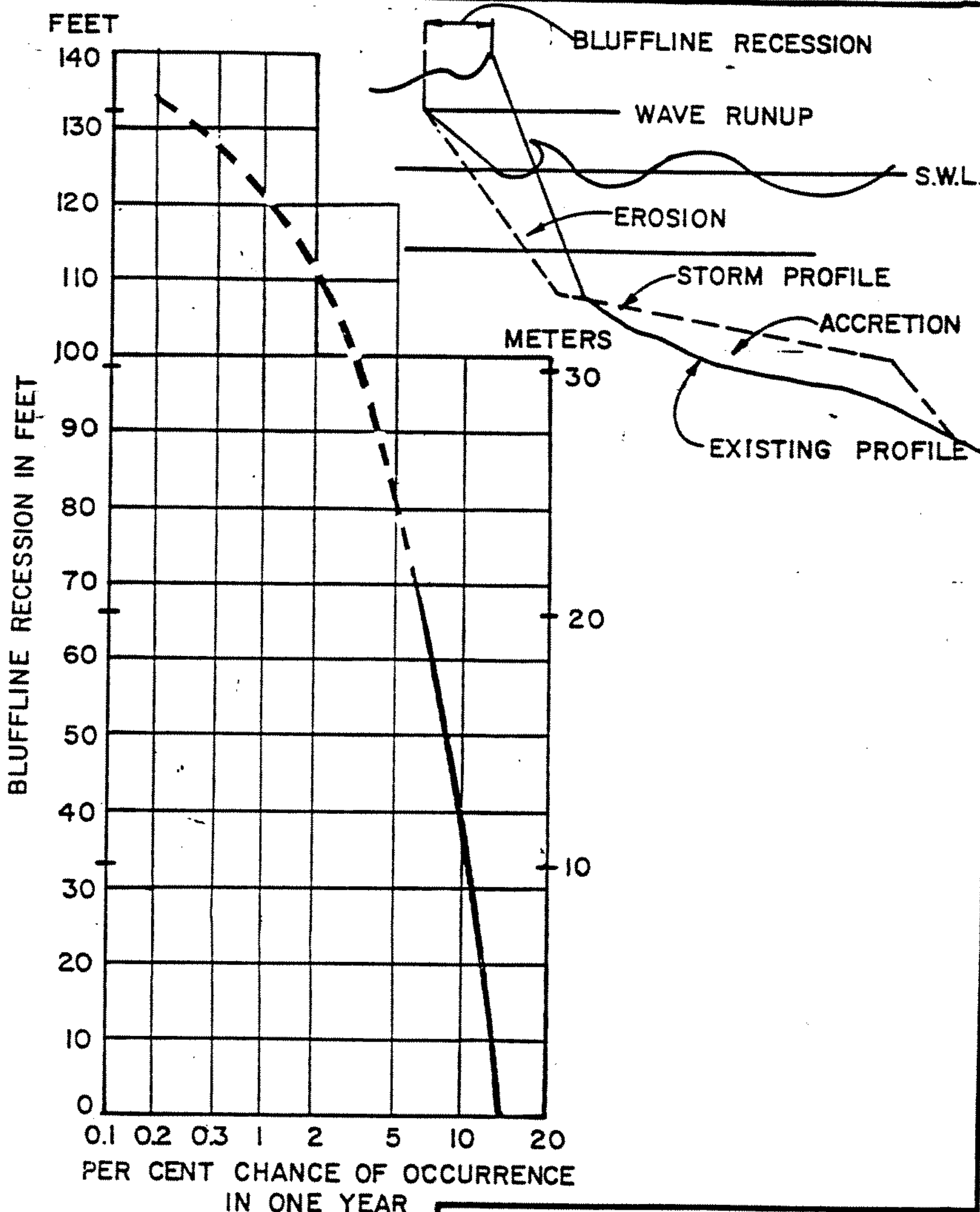
z = value of standardized normal distribution function
x = recession for which the probability is needed
m = mean recession predicted by Edelman method

z is found in standardized probability distribution tables with the corresponding values of probability listed. Using the previously discussed proceedure, the probabilities of occurrence of various width of recession that would accompany surges of given frequencies were computed. The results of these calculations are summarized on table C-2 and illustrated below:

mean recession m = 55 feet
width considered x = 70 feet
$z = (70-55) \div 27.5 = 0.545$
Probability of x occurring = .2929

8. The wave runup and bluffline recession calculation are based on the assumption of no significant overtopping. When the wave runup elevation reaches an elevation higher than the natural dune elevation, the curve in Figure C-2 should be stopped. Due to the variation of dune heights along the county shoreline, this has not been shown in Figure C-2. The degree which the Edelman method is valid when overtopping begins has not been determined, but is assumed to continue for sometime after overtopping starts. This transition region is marked by dashed lines in Figure C-2.

1/ Personal communication with representative of Arthur V. Strock & Associates, Inc., Consulting Engineers, Deerfield Beach, Florida.



BEACH EROSION CONTROL
Review Study
Pinellas COUNTY, FLORIDA

BLUFFLINE RECESSION FREQUENCY

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

BEACH ELEVATION AND WIDTH

9. Due to engineering economics and constructability constraints, the minimum project that could be constructed would be a project with a 20-foot berm width and a +6 M.L.W. elevation (8-year protection). Projects with wider berm width and with higher berm elevation were also considered to determine optimum beach width under NED Standards for both damage prevention and recreation benefit analysis, and are shown in Table C-1. There are three general considerations for the selection of a design dune (berm) height. The first is the natural dune elevation. Construction of a dune substantially higher than this may obstruct the view of shoreline residents or cause increased erosion due to wind blown sand or drainage/passenger routes cut thru the dune. Protective dunes built too low may offer little protection to upland development or existing dunes. In addition, protective dunes constructed too low may leave low areas along the coast that could be eroded faster during lesser storms. Secondly, the protective dune can be built up to protect against design surge and runup. A dune of sufficient height can protect lower areas to the rear of the dune line from overtopping and flooding. Lastly, the dune elevation should be higher than the runup elevation associated with a surge to the level of the natural elevation back of the dune. A higher dune would not stop back island flooding caused by the rise of estuary levels during storms.

a. The dune (berm) elevations selected for various designs are shown in Table C-1. These elevations were selected as a compromise between the natural elevations existing throughout the Pinellas County barrier islands and wave runup elevations.

TABLE C-2

PROBABILITY OF RECESSION BEING EQUAL OR GREATER THAN "X"

Return Internal	Frequency Percent	Mean Recession	Value of "X" in Feet								
			135	125	120	105	70	65	40	30	25
9	11.1	25	.0000	.0000	.0000	.0000	.0002	.0007	.1157	.3446	.5000
10	10.0	30	.0000	.0000	.0000	.0000	.0038	.0099	.2514	.5000	.6304
11.1	9.0	40	.0000	.0000	.0000	.0006	.0668	.1056	.5000	.6915	.7734
15.4	6.5	65	.0157	.0326	.0455	.1093	.3223	.5000	.7791	.8592	.8907
18.2	5.5	70	.0316	.0581	.0766	.1587	.5000	.5529	.8043	.8729	.9008
31.3	3.2	105	.2840	.3518	.3890	.5000	.7476	.7770	.8921	.9236	.9358
50.0	2.0	112	.3407	.4082	.4431	.5497	.7734	.7994	.9008	.9279	.9399
76.9	1.3	120	.4013	.4665	.5000	.5987	.7975	.8204	.9087	.9322	.9433
100.0	1.0	123	.4227	.4870	.5190	.6152	.8056	.8297	.9130	.9345	.9444
200.0	0.5	125	.4364	.5000	.5319	.6255	.8106	.8315	.9131	.9357	.9452
370.3	0.27	128	.4563	.5187	.5498	.6405	.8175	.8375	.9155	.9370	.9463
500.0	0.2	135	.5000	.5588	.5886	.6714	.8323	.8501	.9203	.9400	.9484

VOLUME OF MATERIAL

10. The volume of material required for each of the considered beach fills is tabulated on table C-3. As is indicated on that table the beach fill is comprised of the volume of material required to produce the desired width, the volume of material expected to be lost as a result of the sorting action of the waves, and a volume of material for advanced nourishment. The volumes of initial fill were determined by utilizing sketches of the considered design section imposed on plots of existing beach profiles. The volume of material required to account for sorting losses was based on the designated fill factor. A discussion of this fill factor is presented in other sections of this appendix. The volume of material required for advance nourishment is based on annual historic losses, the designated fill factor and nourishment at the interval indicated.

11. As previously stated the volume of initial fill was computed utilizing sketches of the considered design section imposed on plots of existing beach profiles. On these sketches, the slope of the considered section usually intersected the existing ocean bottom at a depth of about 10 feet. Considering the configuration of the ocean bottom along the project reaches, it is reasonably certain that profile adjustment out to about the 10-foot depth will occur.

GEOTECHNICAL INVESTIGATIONS

12. Geology. The State of Florida occupies a portion of a much larger geographic unit, the Floridian Plateau. Deep water of the Gulf of Mexico is separated from deep water of the Atlantic Ocean by a partially submerged platform nearly 500 miles long and about 250 to 450 miles wide. During geological time the plateau has been alternately dry land or covered by shallow seas. Each retreat of the sea left marine deposits which, during subsequent advances of the sea, were moved about by waves and currents to form beaches, offshore bars, and islands. During earlier times, the mainland area of Pinellas County, most of which is now occupied by St. Petersburg, was a small island well offshore in the mouth of a very broad embayment or indentation in the coast. The last retreat of the sea to its present level occurred during the Wisconsin glacial stage, some 40,000 or 50,000 years ago. Since then, or in geologically recent times, shore processes have reshaped the broad embayment mentioned above into what is now the general bay area around Tampa, and enlarged and extended the earlier small island at the mouth to where it joins the mainland to the north. Those processes have also formed the present beaches and the numerous offshore barrier islands and shoals in the area. The barrier islands consist of unconsolidated sand and shell overlying the Miocene Tampa and Hawthorne limestones.

TABLE C-3

REQUIRED VOLUME OF FILL

Degree of Protection	Berm Width (feet)	Segment	Initial Volume (1000 cy)	Sorting Losses 2/ (1000 cy)	Advanced Nourishment3/ (1000 cy)	Total Volume (1000 cy)
10 yr	40	Honeymoon	69	7	30	106
		Clearwater	75	8	20	103
		Sand Key	2173	217	280	2670
		Long Key	42	4	100	146
15 yr	65	Honeymoon	116	12	45	169
		Clearwater	129	13	30	172
		Sand Key	2700	270	280	3250
		Long Key	60	6	100	166
30 yr	100	Honeymoon	192	19	45	256
		Clearwater	214	21	30	265
		Sand Key	3545	355	280	4180
		Long Key	85	9	100	194

1/ Return interval of surge.

2/ Based on a fill factor of 1.10.

3/ Honeymoon and Clearwater Beach Islands apply 2-year adv. nourishment; Sand Key apply 5-years adv. nourishment; and apply 2 years adv. nourishment at Long Key.

13. Within the last few years strong evidence has been produced of a small general rise in sea level along the coasts of the United States. The indicated rate of rise along the gulf coast of Florida is about .01 foot a year. It thus appears that the shorelines of this and other coastal areas may again be entering a cycle of submergence instead of one of emergence as in the recent geological past. Melting of the polar ice caps appears to be the primary cause of the rise in sea level.

Investigations performed.

14. Previous investigations. Prior to any investigations directly related to the subject study, nine core borings had been taken in the general vicinity of the study area. The borings were taken in 1960 for the West Coast Intracoastal Waterway project. They were located in the bay area between Clearwater Pass and North Redington Beach. The underlying material in that area is rock, mantled by varying amounts of sand, silt, and clay. The deposits of sandy material which were suitable for beach restoration were removed when the channel for the waterway was dredged.

15. Four core borings and fourteen jet probings were taken in 1964 for the Pinellas County Beach Erosion Control Study. These were located 1,000 feet offshore along the southern Pinellas County shoreline. The borings are located on plate C-2. The materials encountered were sand, silty sand, and clayey sand with varying shell content.

16. For the 1964 study, 59 surface sand samples were obtained from the backshore, foreshore, and at -3, -6, -12, and -18 feet on 11 representative beach profiles. Median diameter of the samples obtained ranged from 0.09 to 1.70 millimeters. Average median diameter of samples collected along the backshore ranged from 0.20 to 0.34 millimeter; average median diameter at -18 feet was 0.14 millimeter.

17. Seventeen core borings were obtained in 1968 in a borrow area 1,000 feet offshore from Treasure Island. The area was used as the sand source for initial construction of the Treasure Island beach erosion control project in 1969. The material was mostly shelly, silty, fine to medium quartz sand. The borrow area and boring locations are shown on plate C-3.

18. In 1969 an investigation was begun for a source of sand offshore from Indian Rocks Beach. The investigation consisted of subsurface exploration by means of probings and three core borings. Determination of core boring locations was based on a closely spaced pattern of jet probings taken prior to and during core boring operations. The probings were taken to establish the localities of maximum thickness of unconsolidated material present in the area under study. The core borings and probings offshore from Indian Rocks Beach disclosed that hard rock is present at ground surface or beneath several feet of stiff clay. Isolated pockets of sand existing in depressions in the rock are only a few feet thick. An underwater examination by divers was performed to verify these findings. Consequently two core borings were

taken on the shoal at the south side of Clearwater Pass, which disclosed the presence of a sand source there. The sand is white to light gray or tan, quartz, has varying amounts of shells intermixed, and is suitable for beach restoration. A volume of 400,000 yd^3 was believed to be present there.

19. In late 1972 the investigation was resumed with the taking of 17 core borings in the Intracoastal Waterway to the east of the study area. These borings were taken to explore the existing spoil islands and natural shoals in the reach from Clearwater Pass to North Redington Beach. A sand source was found at two spoil islands. One of these is located about 1/2 mile north of Belleair Causeway and the other, combined with a natural shoal, is about 1 mile north of the causeway. The material in these two areas is suitable for beach restoration. These areas were partly surrounded by soft silty material which must be avoided, and which presents problems of access for dredging equipment.

20. In early 1973 the investigation was continued with the taking of additional jet probings and core borings. These were located offshore from the beach along the entire reach from Clearwater Pass to Johns Pass (except for the reach previously investigated directly offshore from Indian Rocks Beach). The area covered by probings lies between 1,000 and 5,000 feet offshore. The probings were generally spaced at 100-foot intervals along profile lines running normal to the shoreline. The profile lines are 1,000 feet apart. Based on probing information, 43 core boring locations were established and the borings taken. The probings and borings disclosed the presence of sand along the bottom of the Gulf over the majority of the area. The sand is generally very silty and not suitable for beach fill. The layer is present in an average thickness of about 5 feet, and is underlain by soft or firm silt or clay. In local areas, the sand layer is as thick as 13 feet and has a lower silt content. It would not be advisable to attempt using the material for beach fill, however, as the areas are small and surrounded by undesirable material. Since the borings and probings did not encounter suitable sand in the area, three additional core borings were taken on the shoal to the south of Clearwater Pass. These borings reconfirm the presence of a suitable sand source in the shoal. The location maps and probing data for these earlier investigations are shown on plates C-3 through C-8.

21. Recent investigations. Continuing the investigation for a source of sand, high resolution subbottom geophysical profiling was run by the Jacksonville District in 1979 from Blind Pass to the Clearwater Municipal Pier. Profile lines ranged from 1 mile to 5 miles offshore and were generally spaced 4,000 feet apart. Nine core borings were drilled in shoal areas associated with the entrance to Tampa Bay, Pass-A-Grille Channel, and Blind Pass.

22. In 1980, subbottom geophysical profiling was completed offshore of the remainder of the county. Ten additional vibracore borings were obtained offshore to qualify the geophysical records and identify suitability of materials for beach fill. The resulting geophysical maps and vibracore samples are be available at the District Office for review.

23. Core boring locations for the recent investigations are shown on plate C-2. All core boring logs are on file at the Jacksonville District and available upon request. Additionally, the GDM Study for Sand Key will contain this information for all of Pinellas County. Representative samples of all materials sampled have been analyzed for grain size distribution and shell content. The results of these tests are summarized on table 1 and on file at the Jacksonville Office and will be included in the Sand Key GDM Study.

24. Sampling associated with maintenance dredging projects in 1979 was performed in Johns Pass and Clearwater Pass. In May 1978, Blind Pass was sampled as a sand source for the Long Key beach erosion control project. Navigation improvement studies for Hurricane and Dunedin Passes have associated sampling along proposed channel alinements.

25. Native beach sampling. To characterize the existing beach materials for the Sand Key segment, eight profile lines, normal to shore, were sampled in 1979. The samples were taken from the seawall or elevation +5.0 feet, mean low water (MLW), to -15.0 feet, MLW, in 5-foot increments of elevation. Fourteen additional sample profiles were taken in 1980, completing coverage of the Pinellas County gulf shoreline. All profile lines were spaced approximately 2 miles apart and are located on plate C-2.

26. Results of investigations. Prior investigations determined that a source of sand was not available nearshore to Sand Key. From Blind Pass to Anclote Key, to the north, the Gulf of Mexico is underlain by a thin sediment layer over limestone. The unconsolidated sediments are generally less than 2 feet thick and limestone is exposed at or near the surface over much of the area. Within this area, from Belleair Beach north, local areas offshore were found to contain sediments in excess of 10-foot thickness. Most of these sediments were found to be silt overlying limestone. Generally, sand suitable for beach fill was located as a thin surface cover less than 3 feet thick over silt or limestone. The shallow nature of these deposits limit their usefulness as a sand source.

27. From Blind Pass south to Egmont Key, sediment thickness increases rapidly to create essentially unlimited volumes of unconsolidated sediments. These sediments fill relic channels associated with the tidal entrances to Tampa Bay. The sediments sampled by core borings in this area range from a clean, shelly sand to silt interbedded with thin sand seams. Large volumes of clean sand will be available as a source for beach fill from this area.

28. Materials encountered.

a. Native beach sand. The character of the sand along the Pinellas County shoreline was found to be fairly uniform, varying mainly in shell content. The composite gradation for the native material was divided into the three sections (plate C-1 and table C-4) representing areas north of Sand Key (P/L-1 to P/L-6), Sand Key (P/L-A to P/L-H), and south of Sand Key (P/L-7 to P/L-14). The composite mean grain sizes for these curves are 2.40 phi (0.19 mm), 2.28 phi (0.21 mm), and 1.54 phi (0.34 mm), respectively. Composite sorting values are 0.71 (moderately sorted), 0.86 (moderately sorted), and 1.58 (poorly sorted). Silt content was generally less than 2 percent. On Sand Key, from elevations -10 to -20 feet, m.l.w., the silt content ranged from 1 percent to 30 percent, by weight, with a mean value of 9 percent. These results are not significantly different from those samples collected in 1964. Visual estmates of shell content ranged from less than 1 percent to 99 percen with a mean value of 17 percent. The shell content for the three sections, from north to south, was 10 percent, 13 percent, and 25 percent. Although not present in each individual sample, overall there is an increase in shell content to the south. Most of the shell is contained in the coarser sand sized fractions. This is the major variations seen in the native material curves on plate C-1. Grain size analysis was performed on composite samples from Sand Key which were acid-treated to remove all carbonate material. The composite mean grain size is 2.71 phi (0.15 mm) with a composite phi sorting value of 0.58 (moderately well-sorted). Shell content was found to be 18 percent by weight.

b. Potential borrow material. The material found in the principal and alternate borrow areas is a fine quartz sand with varying amounts of whole and broken shell. The composite mean grain size is 2.33 phi (0.20 mm) with a composite phi sorting value of 1.60 (poorly sorted). Visual estimates of shell content range from 6 percent to 25 percent with a mean value of 16 percent. Acid treated samples had 20 percent carbonate by weight, composite mean grain size of 2.95 phi (0.13 mm) and a phi sorting value of 0.35 (well sorted). Silt content ranged from 1 percent to 13 percent, by weight, with a mean value of 5 percent.

(1) Principal borrow area. The shoal to the north of the entrance to Tampa Bay has greater than 20 feet of clean, shelly sand. The area outlined on plate C-2 contains in excess of 30 million cubic yards of this material.

(2) Alternate borrow areas. The shoal areas offshore of Pass-A-Grille Channel and Bunces Pass (plate C-2) are comprised to a 10-foot depth of clean shelly sand. This relatively thin deposit is spread over a broad area and is estimated to contain 8 million cubic yards of usable sand. As determined by the geophysical survey, the alternate borrow area may be able to be relocated farther offshore from the present location. Although additional sampling would be required to relocate, this alternative is expressed in order to alleviate any possible environmental or economic reservations concerning the present location.

(3) Other potential sources. Sand shoals on the gulf side of the tidal inlets along the Pinellas County shoreline were evaluated as potential source areas. Use of these areas should be carefully considered. These shoals are ebb-tidal deltas formed by tidal currents through the inlets. The material is usually beach sand in the process of bypassing the inlet. Removing most or all of the shoal will create a sediment trap for the adjacent nourished beaches until the shoal has reformed to most of its former size. One other consideration is the effect on the inlet hydraulics. Removing the influence the shoals have on the system could create changes to inlet morphology besides altering the stability of any Federal navigation projects.

29. The potential available material at Hurricane, Dunedin, and Clearwater Passes is estimated at nearly 300,000 cubic yards each. The city of Clearwater has purchased a small dredge for maintenance of their beaches and navigation channels. It is believed they plan on using the shoal areas of Clearwater Pass for beach renourishment. Johns Pass and Blind Pass shoals were found to contain beach quality material immediately offshore and, in alinement with the channel. This material is bordered by very silty and in the former, some clayey sand considered unsuitable for use as beach fill. Sand shoals in the throat of these tidal inlets (the narrow portion directly between islands) will generally be clean sand. This material, although also a potential source, is limited in quantity.

30. Shoal material from the maintenance of Blind Pass and the Federal navigation channels at Clearwater and Johns Passes has been placed on adjacent beaches. This material will periodically become available and should continue to be suitable for beach fill.

31. The proposed navigation projects at Dunedin and Hurricane Passes are cut through clean and silty sand, respectively. Dunedin Pass channel contains 200,000 cubic yards to an elevation of -15 feet, MLW. This material is in the seaward 12,000 feet along the southern alinement of the channel. Hurricane Pass channel would provide 100,000 cubic yards of sand to an elevation of -13 feet, MLW. This channel is 11,500 feet in length. Both volumes are calculated using the 50-foot proposed project width.

32. Suitability analysis. The results of the grain size analysis was used to compare the native beach sand with that of the potential borrow areas. The adjusted SPM method, as proposed by James, Techniques in Evaluating Suitability of Borrow Material for Beach Nourishment, U.S. Army Corps of Engineers Coastal Engineering Research Center, Technical Memorandum No. 60, 1975, was used as the best indicator of relative suitability of material for beach fill. A composite grain size distribution curve for the beach sand was obtained by averaging the individual sieve data from each sample. Utilizing this distribution and a similar composite distribution for the principal and alternate borrow sites, a comparative suitability analysis was performed. The overfill ratios are presented on table C-4 along with a summary of textural analysis. These materials are very compatible for use as beach fill. The excessively high overfill ratio (2.50) for the beaches south of Sand Key (P/L-7P/L-14) is brought about by the large percentage of coarse shell fragments found in the sand, as previously discussed. Past experience has shown the suitability analysis extremely sensitive to these conditions, resulting in an unreasonable overfill ratio. Therefore, it is suggested that the 2.50 overfill ratio be substituted with a mean value of 1.12 for the principal borrow area. Plate C-1 is a plot of the composite grain size distribution for both the native and borrow materials.

33. Conclusions. Investigations have shown there is no suitable sand source within 5 miles offshore of all but the southernmost portion of Pinellas County. There are limited quantities of materials available in shoals associated with the tidal inlets and navigation channels. Most of these shoal areas are not recommended for complete extraction due to the

unknown effect this may have on the inlet-bay tidal hydraulic system. Recent sampling has shown ample supplies of suitable material in the shoal area on the north side of the entrance to Tampa Bay. An alternate borrow area is located in the broad shoal offshore of Pass-A-Grille north channel and Bunces Pass.

CONSTRUCTION

34. Should the proposed project be authorized and funded for construction, it could be designed and constructed in about 2 years. Advanced engineering and design studies would take from 12-18 months. Actual construction would take about 6-12 months (see figure C-2). The construction process would involve the use of a hydraulic dredge operating at the selected borrow area. This dredge would obtain material from the designated borrow area and pump it onshore when the borrow area is in proximity to the disposal site. For the case in which the borrow area is a significant distance from the disposal site, the borrow material would be transported by hopper dredge or barge to a preselected offshore site. The borrow material would be pumped onshore from this site. The material would be spread and shaped by mechanical methods once it reached the beach to achieve the design section. Mechanical shaping would only occur above mean low water; the remaining foreshore would be allowed to assume a slope compatible with the wave climate.

TABLE C-4

SUMMARY OF COMPOSITE TEXTURAL ANALYSIS

Composite Distributions	Grain Size at Percent Shown					Mean Grain Size	Sorting	Adjusted S.P.M. Overfill Ratio	
								Borrow Areas	
	5%	16%	50%	84%	95%			Principal	Alternate
P/L-1 - P/L-6	-0.50	1.69	2.60	3.11	3.48	2.47	0.96	1.13	1.23
P/L-A - P/L-H	-1.28	1.42	2.60	3.14	3.80	2.39	1.20	1.10	1.17
P/L-7 - P/L-14	-1.65	-0.04	2.49	2.11	3.42	1.85	1.56	2.50	1.20
Principal Borrow Area	-1.90	1.57	2.78	3.20	3.60	2.52	1.24	-	-
Alternate Borrow Area	-2.62	-0.08	3.02	3.49	4.35	2.14	1.95	-	-
P/L-A - P/L-H Less Carbonates	1.60	2.12	2.75	3.25	3.57	2.71	0.58	-	-
Borrow Areas Less Carbonates	2.25	2.55	3.00	3.30	3.35	2.95	0.35	-	-

NOTE: All grain sizes reported in phi (Ø) units, phi size is a logarithmic scale based on the conversion Ø = $-\log_2$ (grain size in mm), used in the study of sediments.

Mean Grain Size = $\frac{Ø16+Ø50+Ø84}{3}$ Sorting = $\frac{Ø84 - Ø16}{4} + \frac{Ø95 - Ø5}{6.6}$

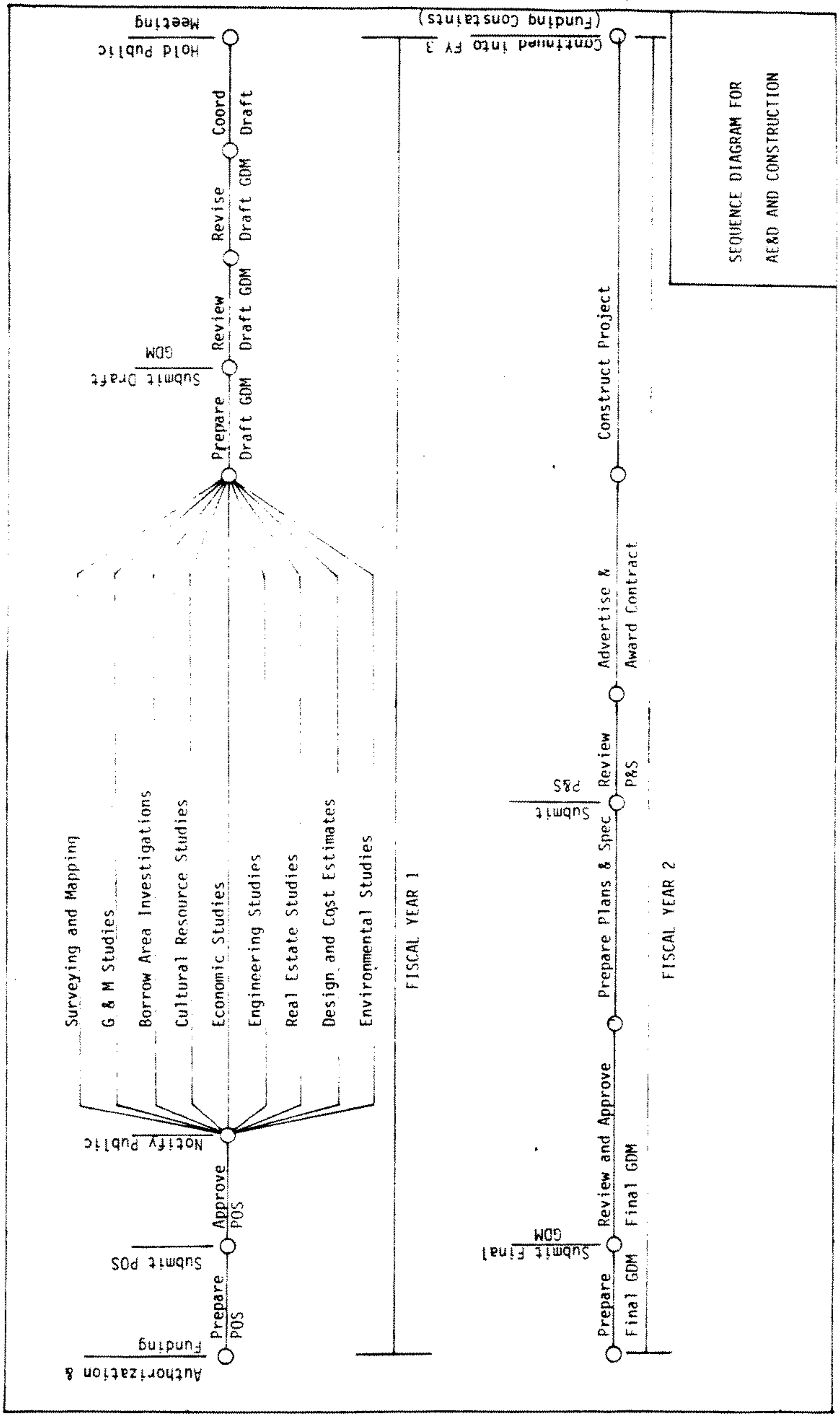
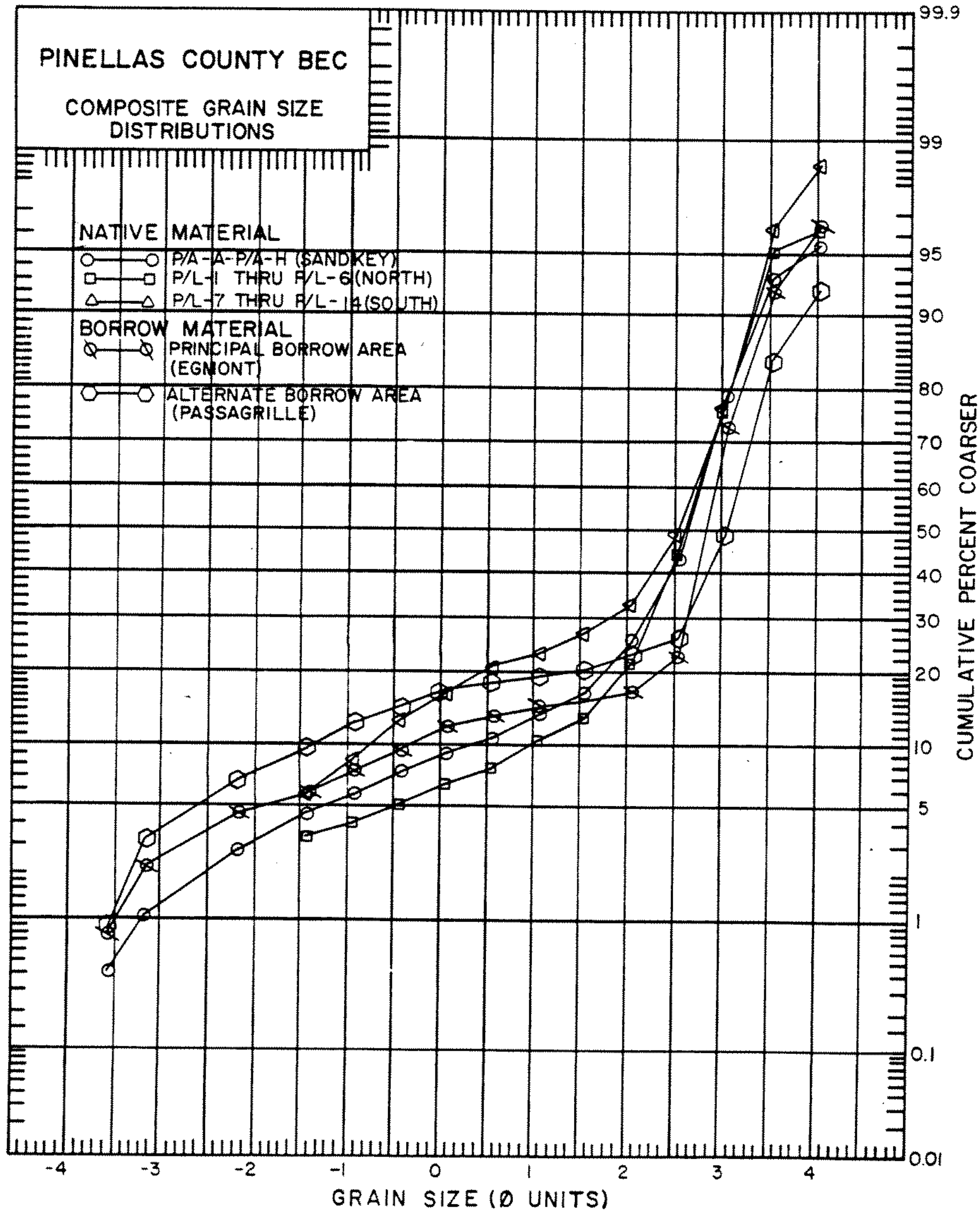
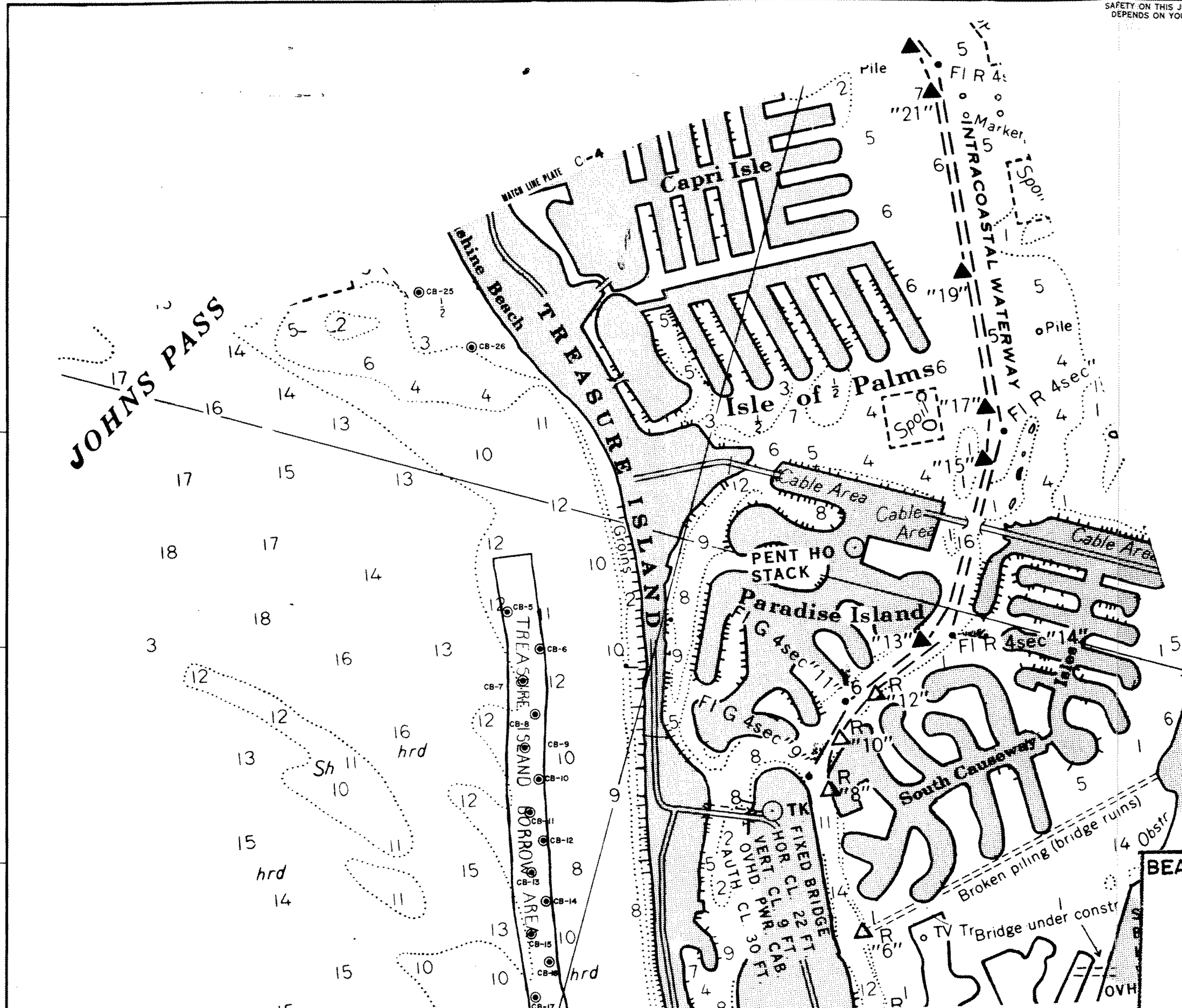

SEQUENCE DIAGRAM FOR
AE&D AND CONSTRUCTION
Authorization & Funding
Prepare POS
Submit POS
Approve POS
Notify Public
Surveying and Mapping
G & M Studies
Borrow Area Investigations
Cultural Resource Studies
Economic Studies
Engineering Studies
Real Estate Studies
Design and Cost Estimates
Environmental Studies
Prepare Draft GDM
Submit Draft GDM
Review Draft GDM
Revise Draft GDM
Coord Draft
Hold Public Meeting
FISCAL YEAR 1
Prepare Final GDM
Submit Final GDM
Review and Approve Final GDM
Prepare Plans & Spec
Submit P&S
Review P&S
Advertise & Award Contract
Construct Project
Continued into FY 3 (Funding Constaints)
FISCAL YEAR 2

FIGURE C-3



PINELLAS COUNTY BEC
COMPOSITE GRAIN SIZE DISTRIBUTIONS
NATIVE MATERIAL
P/A-A-P/A-H (SANDKEY)
P/L-1 THRU P/L-6 (NORTH)
P/L-7 THRU P/L-14 (SOUTH)
BORROW MATERIAL
PRINCIPAL BORROW AREA (EGMONT)
ALTERNATE BORROW AREA (PASSAGRILLE)
99.9
99
95
90
80
70
60
50
40
30
20
10
5
1
0.1
0.01
CUMULATIVE PERCENT COARSER
-4
-3
-2
-1
0
1
2
3
4
GRAIN SIZE (Ø UNITS)

PLATE NO. C-1



SAFETY ON THIS JOB DEPENDS ON YOU

REVISIONS					
NO.	SYM.	ZONE	DESCRIPTION	DATE	APPROVED

DATES OF INVESTIGATION

CB-IWW-W-35 THROUGH 43	1960
CB-5 THROUGH 23 (TREASURE ISLAND)	1968
CB-1 THROUGH 5 (INDIAN ROCKS) I. R. P/L 2 THROUGH 11 (PROBINGS)	1969
CB-IR-1 THROUGH 17	1972
CB-IR-1A THROUGH 42A-11 P/L-1 THROUGH 41	1973

FOR LEGEND SEE PLATE D-8

GRAPHIC SCALE

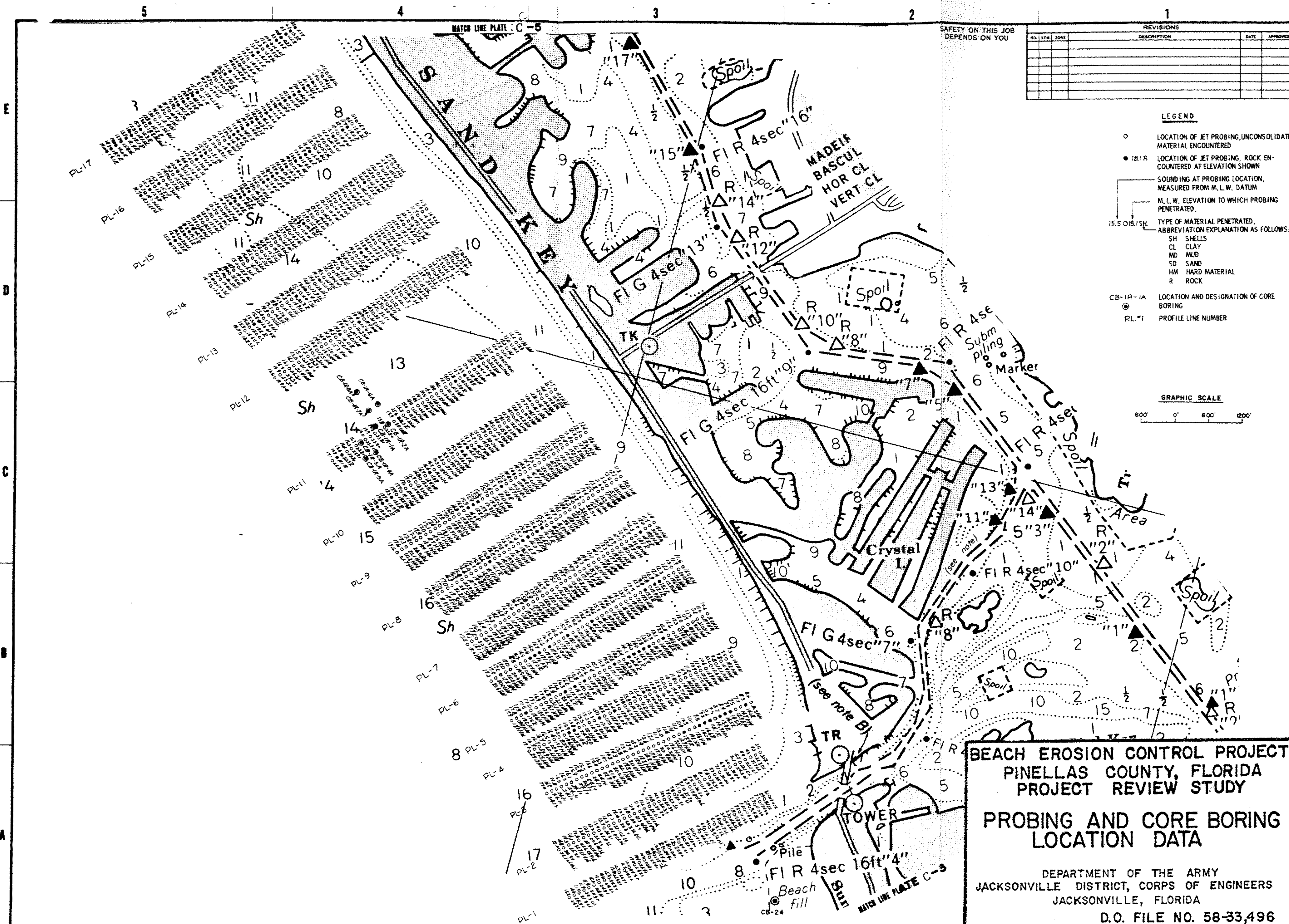
600' 0 600' 1200'

BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
PROJECT REVIEW STUDY

CORE BORING LOCATION MAP

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

D.O. FILE NO. 58-33,496

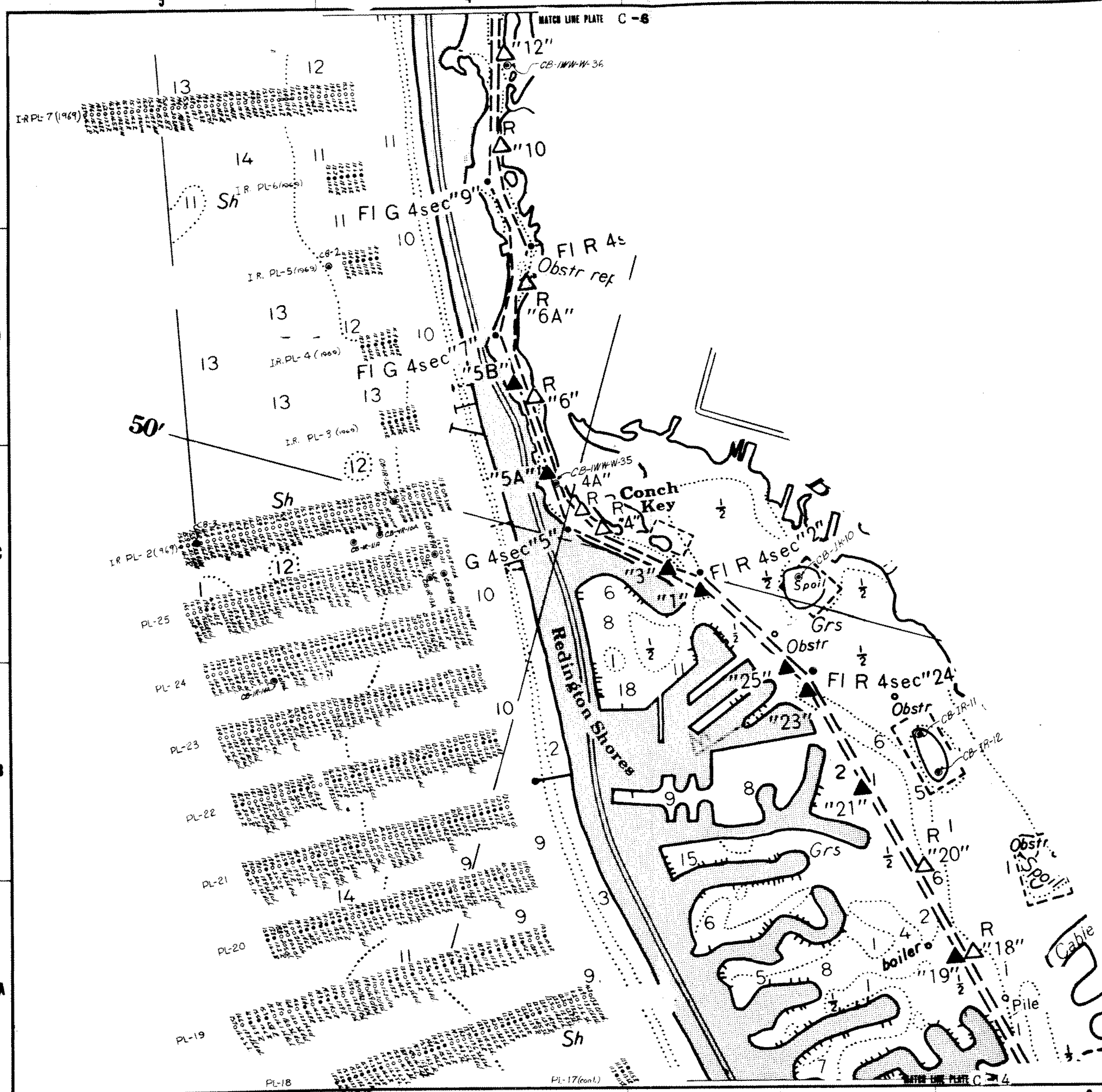


MATCH LINE PLATE C-5
SAFETY ON THIS JOB DEPENDS ON YOU
REVISIONS
NO. SYM. ZONE DESCRIPTION DATE APPROVED
LEGEND
LOCATION OF JET PROBING, UNCONSOLIDATED MATERIAL ENCOUNTERED
18.1 R LOCATION OF JET PROBING, ROCK ENCOUNTERED AT ELEVATION SHOWN
SOUNDING AT PROBING LOCATION, MEASURED FROM M.L.W. DATUM
M.L.W. ELEVATION TO WHICH PROBING PENETRATED.
15.5 O 18.1 SH. TYPE OF MATERIAL PENETRATED, ABBREVIATION EXPLANATION AS FOLLOWS:
SH SHELLS
CL CLAY
MD MUD
SD SAND
HM HARD MATERIAL
R ROCK
CB-1R-1A LOCATION AND DESIGNATION OF CORE BORING
PL.#1 PROFILE LINE NUMBER
GRAPHIC SCALE
600' 0' 600' 1200'
SAND KEY
Crystal I.
TK
TR
TOWER
Spoil
Marker
Subm Piling
Pile
Beach fill
(see note B)
Fl G 4sec "13"
Fl G 4sec 16ft "9"
Fl G 4sec "7"
Fl R 4sec "16"
Fl R 4sec "10"
Fl R 4sec 16ft "4"
MATCH LINE PLATE C-3
PL-1 PL-2 PL-4 PL-5 PL-6 PL-7 PL-8 PL-9 PL-10 PL-11 PL-12 PL-13 PL-14 PL-15 PL-16 PL-17
CB-24
BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
PROJECT REVIEW STUDY
PROBING AND CORE BORING LOCATION DATA
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
D.O. FILE NO. 58-33,496

PLATE C-4

SAFETY ON THIS JOB DEPENDS ON YOU

REVISIONS					
NO	SYM	ZONE	DESCRIPTION	DATE	APPROVED



FOR LEGEND SEE PLATE D-8

GRAPHIC SCALE
600' 0 600' 1200'

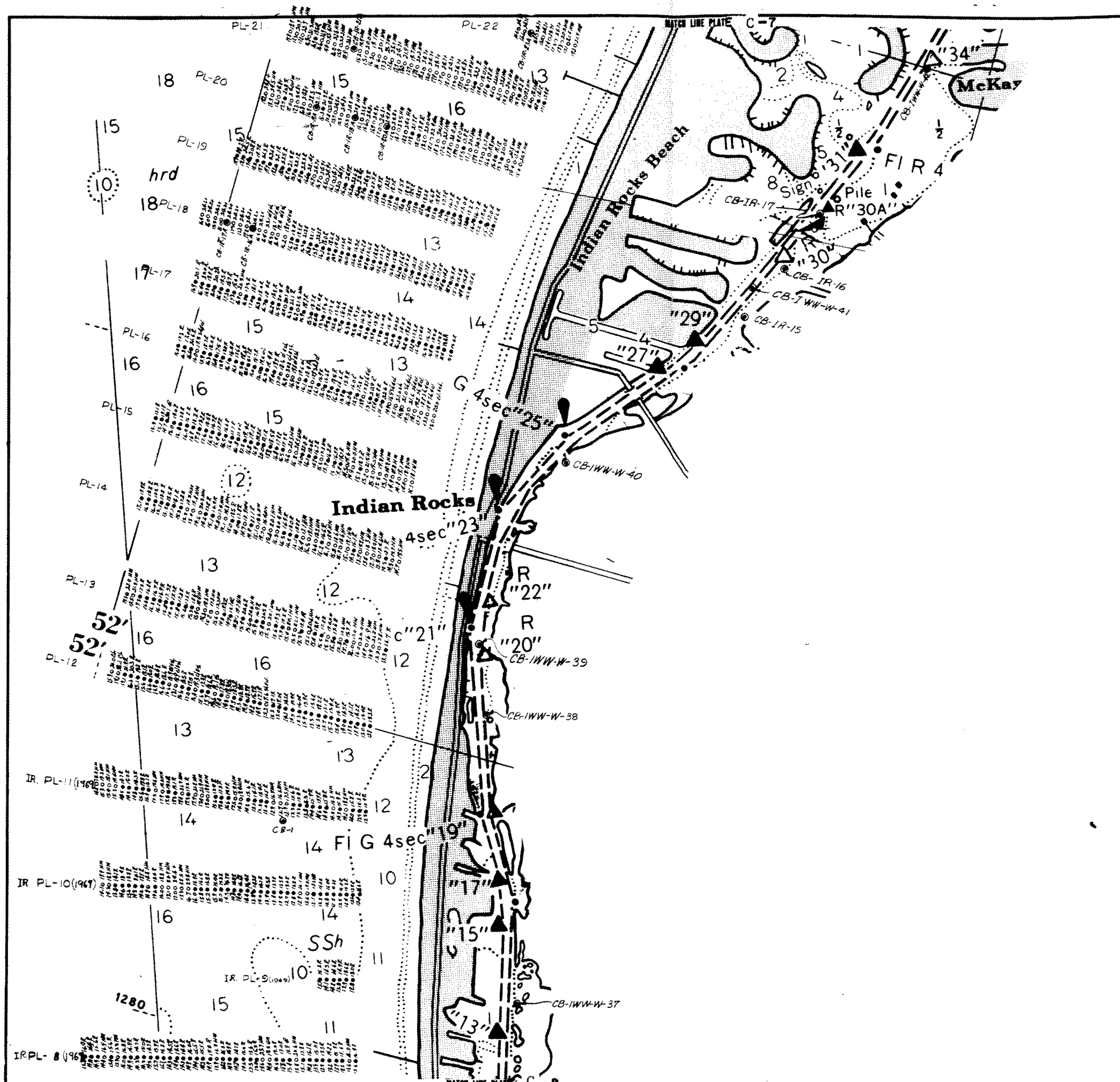
BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
PROJECT REVIEW STUDY

PROBING AND CORE BORING LOCATION DATA

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

D.O. FILE NO. 58-33,496

PLATE C-5

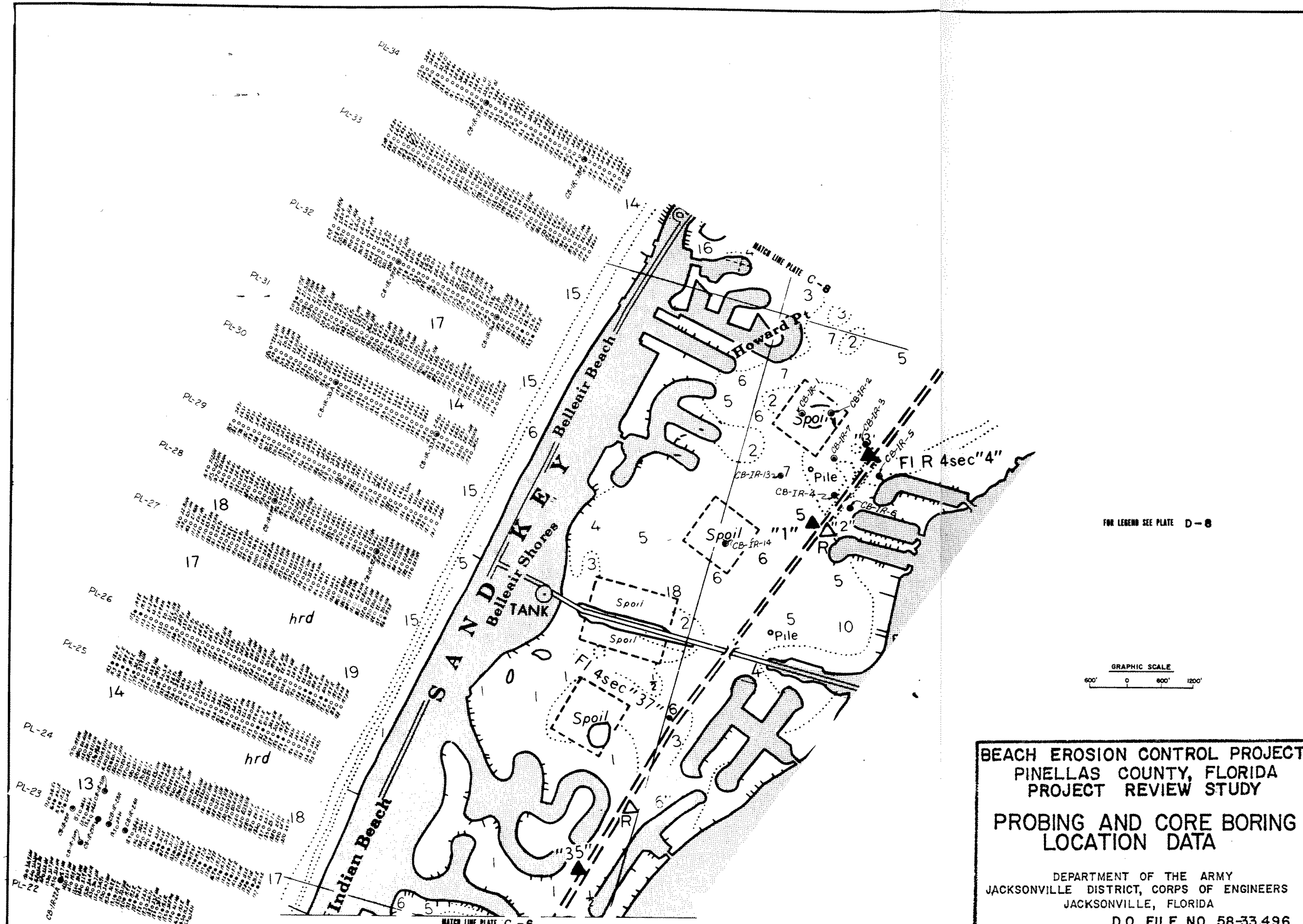


BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
PROJECT REVIEW STUDY

PROBING AND CORE BORING LOCATION DATA

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

D.O. FILE NO. 58-33,496



BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
PROJECT REVIEW STUDY

PROBING AND CORE BORING LOCATION DATA

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

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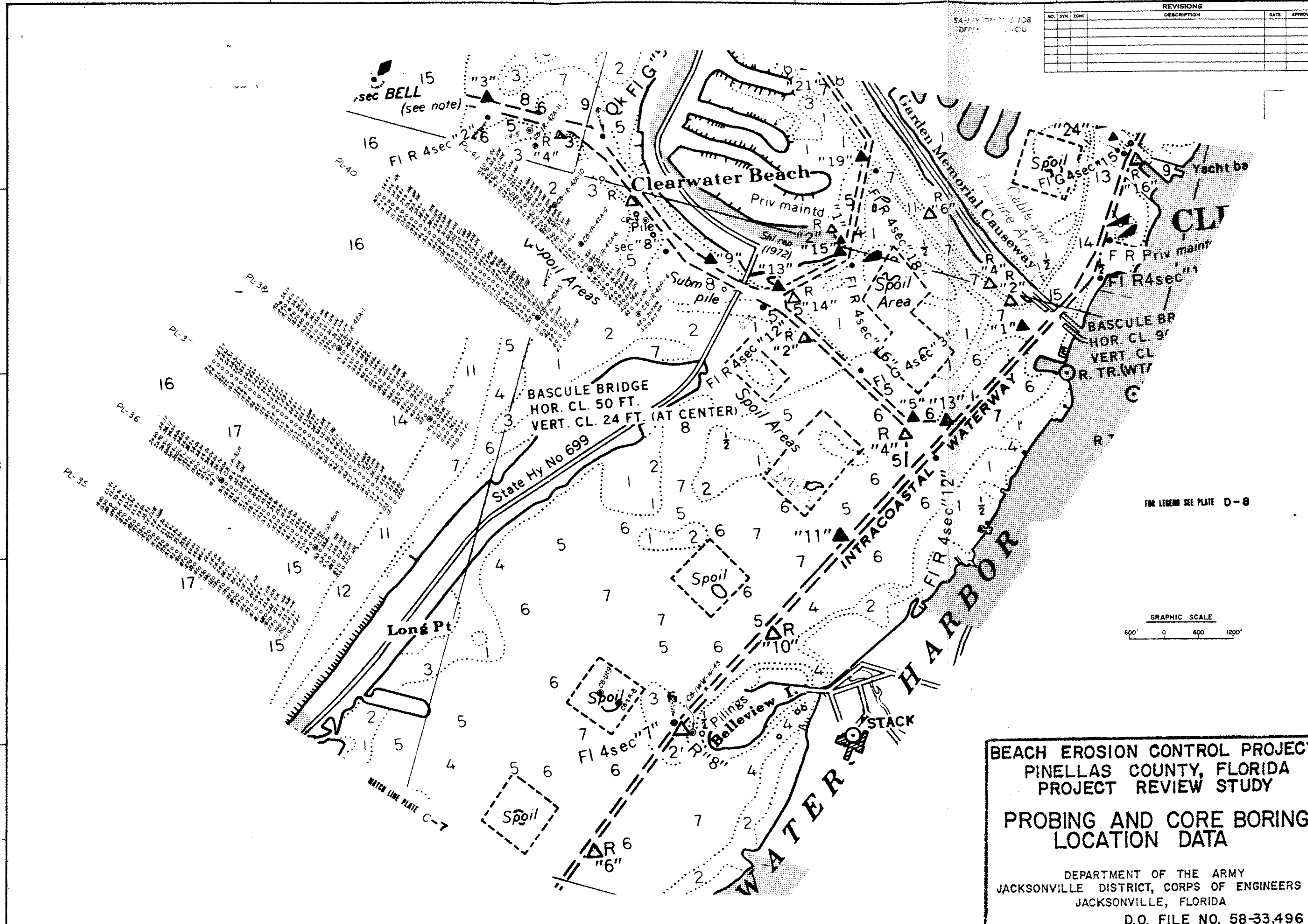

BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
PROJECT REVIEW STUDY

PROBING AND CORE BORING LOCATION DATA

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

D.O. FILE NO. 58-33,496

PLATE C-8

APPENDIX D

ECONOMICS

BEACH EROSION CONTROL REVIEW STUDY

PINELLAS COUNTY, FLORIDA

APPENDIX D

ECONOMICS

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BEACH EROSION CONTROL REVIEW STUDY
PINELLAS COUNTY, FLORIDA

APPENDIX D

ECONOMICS

GENERAL

1. The tangible economic justification of the proposed improvements can be ascertained by comparing the equivalent average annual charges (i.e., interest, amortization, and maintenance costs) with an estimate of the equivalent average annual benefits which probably would be realized over the 50-year period of analysis. In the analysis, the first year of project life was assumed to be 1985. Computed damages and cost are based on January 1984 price levels.

2. The value given to benefits and costs at their time of accrual are comparable by conversion to an equivalent time basis using an appropriate interest rate. A directed rate of 8 1/8 percent applicable to public projects was used for the selected plans presented in this report. The net effect of converting benefits and costs in this manner is to develop equivalent average annual values.

3. A number of economic and physical forces limit the economic life of the project, such as physical depreciation, obsolescence, changing requirements for project services, and inaccuracies in making overly long projections. Based on these factors, an economic life of 50 years was used for project analysis.

4. The development of costs and benefits follows standard Corps of Engineers practice. The value of all goods and services used in the project is estimated on the cost side. On the benefit side, damages prevented and recreational values created are estimated. The development of damages prevented is based on damage surveys which obtain damage information related to stages, or elevations of such damage. This material is then related to frequency data to convert it to average annual values. Modifications in this data, introduced by project effects, permit the computation of annual benefits.

BENEFIT ANALYSIS

5. In the evaluation of this project, the benefits presented in the 1980 interim report (Stage II Documentation) concerning this project were utilized where applicable. Benefits stemming from the elimination of existing erosion control structures and storm damage were updated to reflect

January 1984 price levels and an interest rate of 8 1/8 percent. Benefits stemming from increased recreational use of the beach were reevaluated to reflect current methodologies, cost, and data.

RECREATION BENEFITS

INTRODUCTION

6. The estimated recreational benefits attributable to the project were determined using procedures based on those prescribed in the Principals and Guidelines developed by the Water Resources Council and published 10 March 1983.

7. The methodology used in estimating recreation benefits entails determining the total beach visits to Pinellas County beaches under two different conditions, "With" and "Without" the project implemented. The difference of the results of the two analyses establishes beach visitors attributable to the considered works. Recreation benefits attributable to the considered works were determined by applying a value to the visits attributable to the new beach. The value of a beach visit was based on the results of an analysis which utilized travel cost methodology.

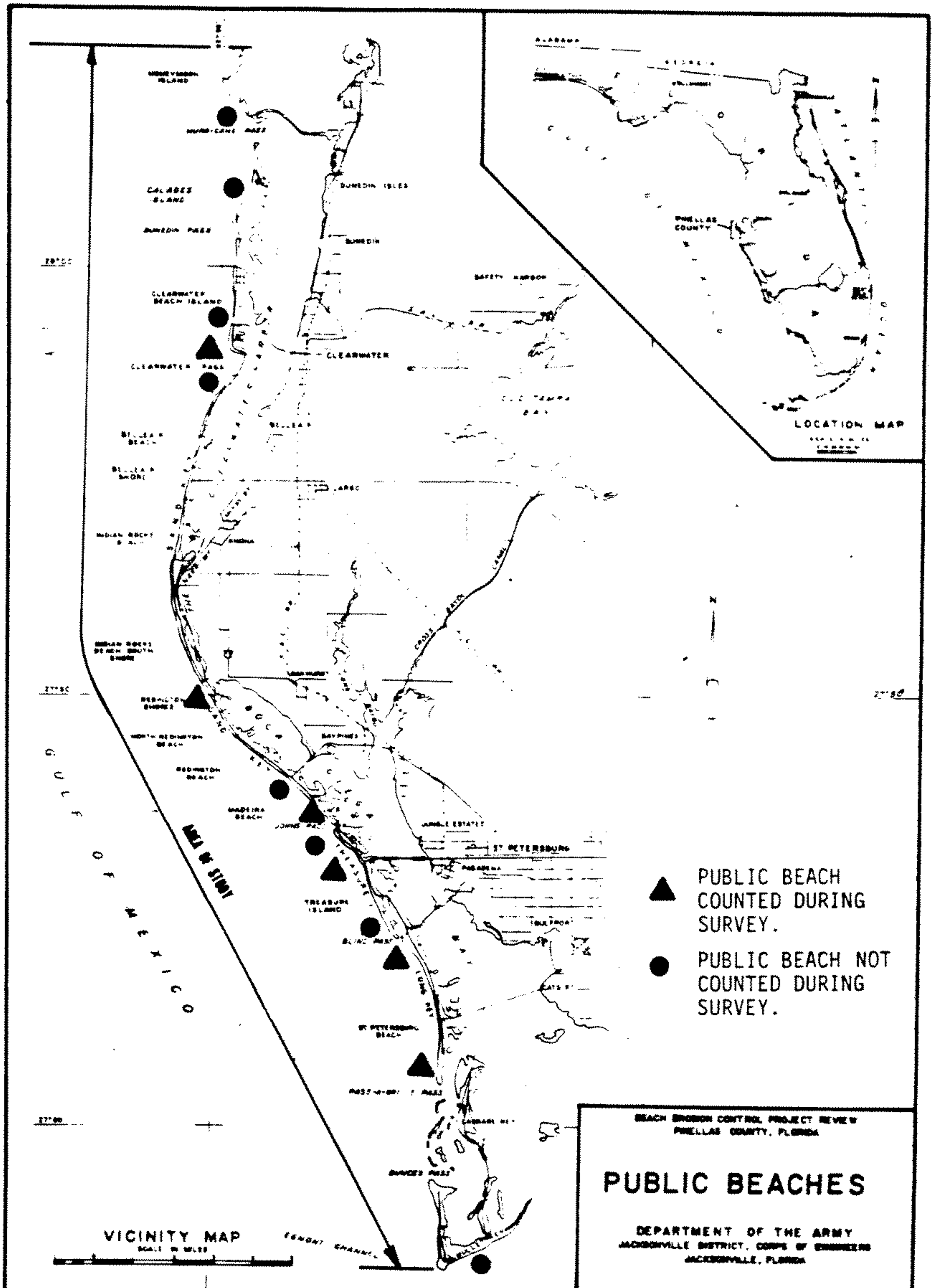
STUDY AREA

8. As related to analysis of recreation benefits the principal study area is Pinellas County; however, visitors from other counties in Florida and out of state visitors recreating in Pinellas County are considered in the analysis. Out-of-state visitors to the county beaches are generally from the eastern and central parts of the United States and other countries. The specific project area extends along the entire gulf coast of Pinellas County, a distance of about 39 miles. Figure D-1 illustrates the study area.

RECREATION RESOURCE

9. The beaches of Pinellas County are the northernmost white sandy beaches on the Florida gulf coast until reaching the panhandle region. These beaches provide an important recreational resource for the year-round enjoyment of residents and tourists. In the analysis of recreation resources, all-recreational beach area in Pinellas County was included to determine the interactive influence of the total county resource on each island segment.

10. Recreational beach area is defined as the publicly-owned beach area lying landward of mean high water which is accessible to the general public. Accessability is based on location of designated access points, available public parking and transportation facilities, available facilities to accommodate walk-on visitors, and the distance a beach visitor could be expected to walk to enjoy an uncrowded area of beach.



HONEYMOON ISLAND
HURRICANE PASS
CALADESI ISLAND
DUNEDIN ISLES
DUNEDIN PASS
DUNEDIN
SAFETY HARBOR
CLEARWATER BEACH ISLAND
CLEARWATER
CLEARWATER PASS
OLD TAMPA BAY
BELLEAIR BEACH
BELLEAIR
BELLEAIR SHORE
LARGO
INDIAN ROCKS BEACH
INDIAN ROCKS BEACH SOUTH SHORE
REDINGTON SHORES
NORTH REDINGTON BEACH
REDINGTON BEACH
MADEIRA BEACH
JOHNS PASS
TREASURE ISLAND
BLIND PASS
ST PETERSBURG BEACH
ST PETERSBURG
PASADENA
CROSS BAYOU CANAL
JUNGLE ESTATES
CABBAGE KEY
BUNCES PASS
EGMONT CHANNEL
GULF OF MEXICO
AREA OF STUDY
27°50'
27°40'
PUBLIC BEACH COUNTED DURING SURVEY.
PUBLIC BEACH NOT COUNTED DURING SURVEY.
VICINITY MAP
SCALE IN MILES
ALABAMA
GEORGIA
PINELLAS COUNTY
LOCATION MAP
BEACH EROSION CONTROL PROJECT REVIEW
PINELLAS COUNTY, FLORIDA
PUBLIC BEACHES
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

FIGURE D-1

Beach Area

11. Under existing conditions, about 7,067,000 square feet of recreational beach is available to the public in Pinellas County (excluding Caladesi Island). A breakdown of this beach area according to location is given in table D-1. In addition, table D-1 estimates the future beach area based on current erosion rates from 1982 to 1985, and thereafter in 10-year increments. The State-operated park at Caladesi Island is limited by design to 3,000 visits per day; therefore, the area was not calculated for this island. Beach widths were developed from Corps of Engineers aerial photography flown in 1981, spot checked by site visit in September 1982. Data on the length and location of publically owned shorefront was provided by Pinellas County.

12. Data provided by the county and from field investigations were analyzed to identify all designated physical access points to Pinellas County beaches. These locations were mapped for the entire county and indicated on figure D-2. It is assumed the average beach visitor would be willing to walk up to 1/4 mile from an access point to enjoy an uncrowded beach area. Therefore, public beach areas on each side of an access point were included in the total available recreational beach area shown in table D-1.

a. It was assumed in the "without project" condition that all beach area would be available for public use if accessible. Use of the beach area above MHW is strictly at the private property owner's perogative. Therefore, the actual beach area available to the public is less than that shown in Table D-1. The over-statement of available public beach area under existing conditions results in a more conservative estimate of beach use for the "with project" condition.

TABLE D-1

SUMMARY OF PUBLIC BEACH AREA
PINELLAS COUNTY 1/
(Units of 1,000 sq. ft.)

Location	Year 1982	1985	1995	2005	2015	2025	2035
Honeymoon Island	215	181	147	113	79	45	11
Clearwater Beach Island	757	746	723	700	677	654	631
Sand Key	1,326	1,152	572	0	0	0	0
Treasure Island 2/	1,880	1,874	1,854	1,834	1,814	1,794	1,774
Long Key 2/	1,078	1,062	1,008	954	900	846	792
Mullet Key	984	820	540	265	0	0	0
North Shore Park 3/	202	185	96	7	0	0	0
Howard Park 4/	625	619	619	619	619	619	619
	7,067	6,759	5,660	4,602	4,190	4,059	3,928

1/ Caladesi Island is not included as boat access limits capacity to 3,000 visitors per day.
2/ Assumes no further maintenance of project beach.
3/ North Shore Park Section 103 project is not recommended for authorization at this time.
4/ Howard Park is assumed maintained by county sources.

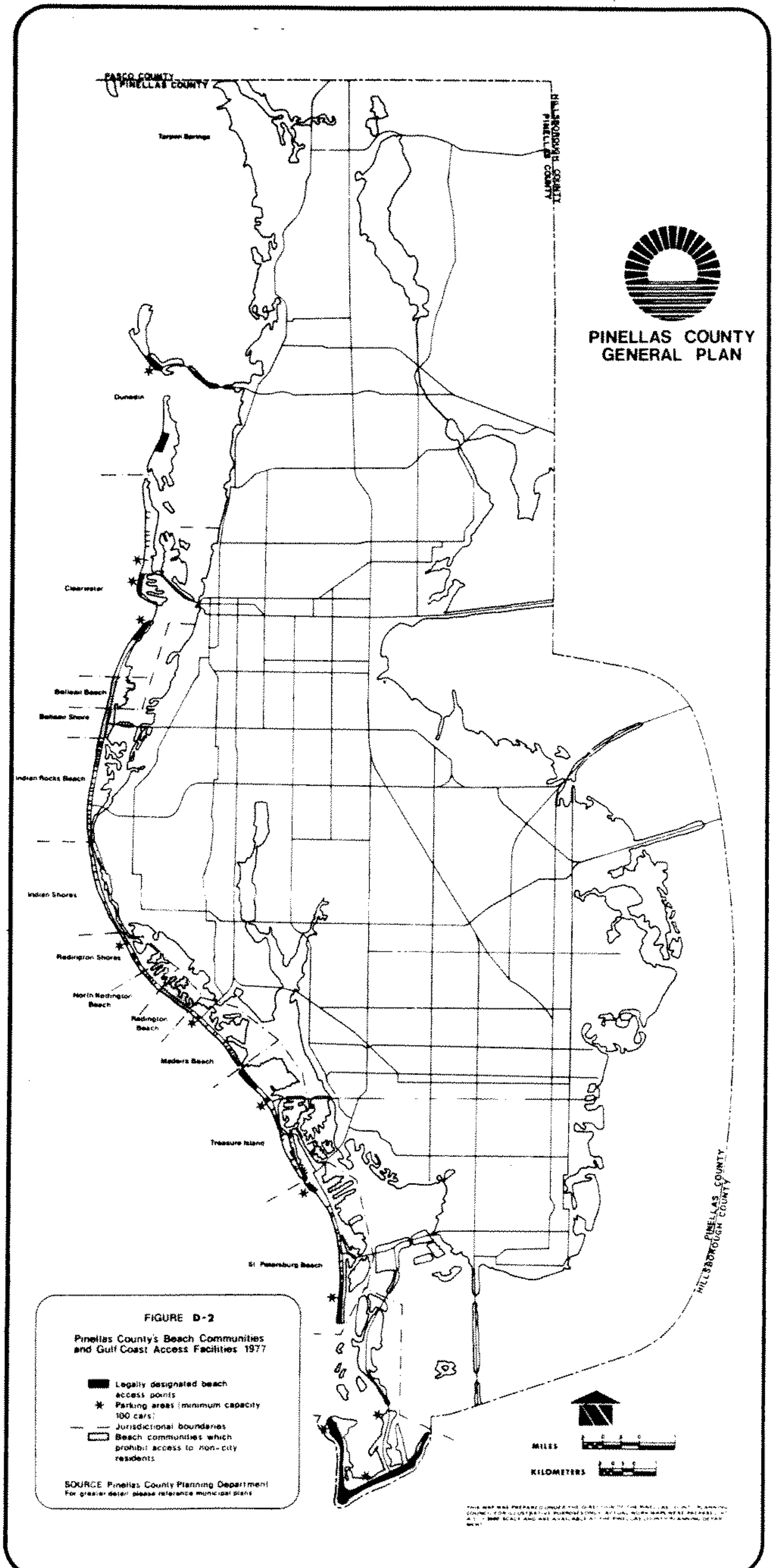
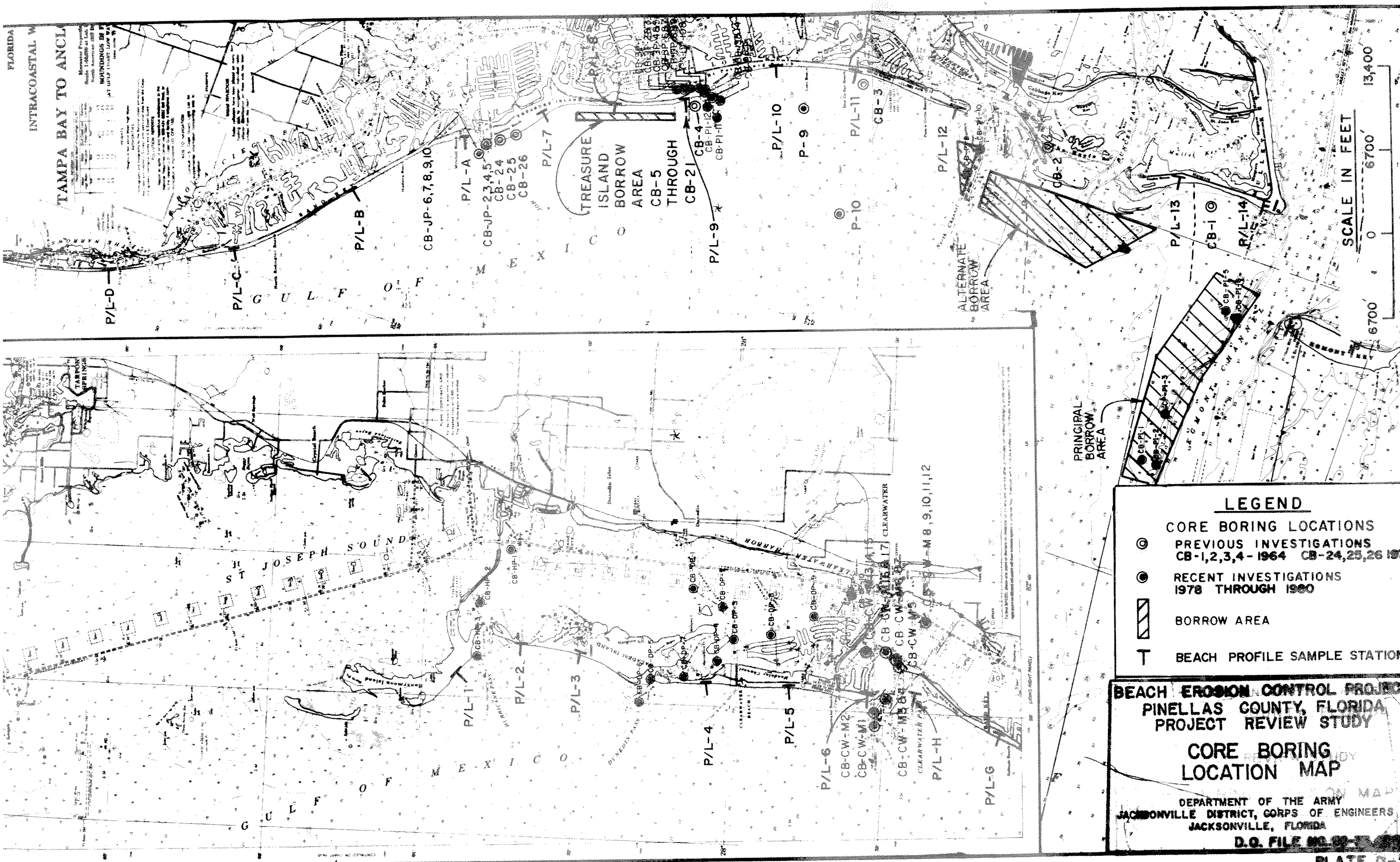


FIGURE D-2

Pinellas County's Beach Communities and Gulf Coast Access Facilities 1977



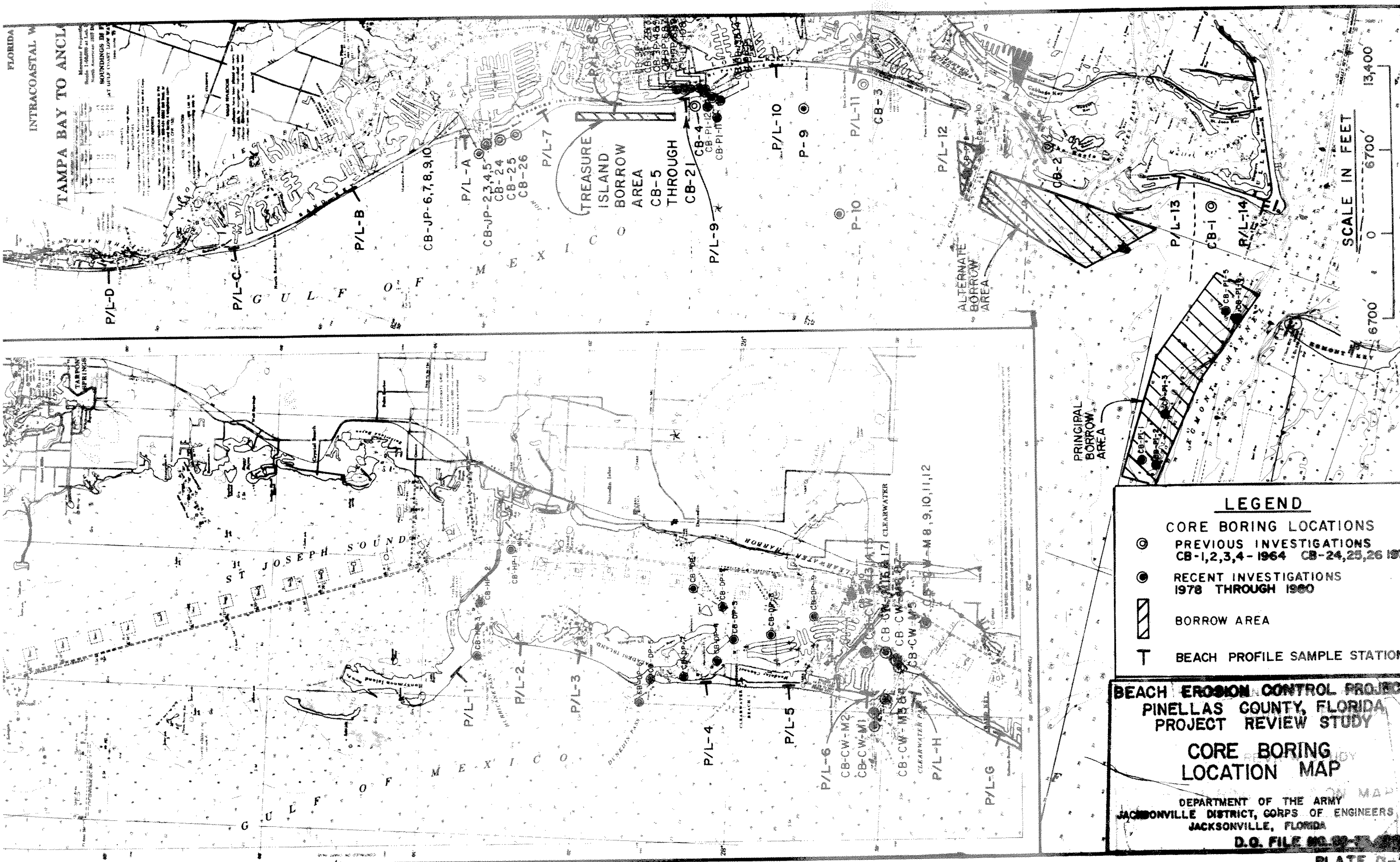
BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
PROJECT REVIEW STUDY

CORE BORING LOCATION MAP

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

D.O. FILE NO.

PLATE D-2



BEACH EROSION CONTROL PROJECT
PINELLAS COUNTY, FLORIDA
PROJECT REVIEW STUDY

CORE BORING
LOCATION MAP

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

D.O. FILE NO.

PLATE D-2

Facilities

13. This section summarizes available public facilities which may restrict the public use of recreational beach area.

14. Parking Facilities. Lack of sufficient parking facilities for the general public located near and accessible to the beach may constitute a restriction on public access and use of the beach. Parking facilities considered herein were located within a 1/4-mile radius of identified beach access points. Aerial surveys and site investigations were analyzed to determine the available public parking facilities for each island and park listed in table D-1. A summary of these facilities is shown in table D-2.

15. Public Transportation. Various bus routes are available to all major islands in Pinellas County. Due to lack of data concerning use of the public transportation, an analysis has not been attempted. However, future beach use may depend largely on public transportation systems due to diminishing area for parking facilities coupled with greater use of the beach.

TABLE D-2

SUMMARY OF PUBLIC PARKING FACILITIES
PINELLAS COUNTY

Location	No. of Parking Spaces		Peak Capacity 1/	
	1982	1985	1982	1985
Honeymoon Island 2/	650	1,500	5,200	12,000
Caladesi Island 3/	--	--	3,000	3,000
Clearwater Beach Island	2,110	2,110	16,900	16,900
Sand Key 4/	5,874	6,500	47,000	52,000
Treasure Island	1,272	1,272	10,200	10,200
Long Key	1,910	1,910	15,300	15,300
Mullet Key	2,962	2,962	23,700	23,700
North Shore Park	1,040	1,040	8,300	8,300
Howard Park	1,550	1,550	12,400	12,400
Total			142,000	153,800

1/ Capacity based on a turnover of 2 and 4 persons per vehicle, rounded to nearest 100.
2/ Honeymoon Island is currently being developed into a State recreation area to include over 1,000 new parking spaces.
3/ Caladesi Island is accessible by boat only. A public ferry is available; capacity is limited to maximum 3,000 visitors.
4/ Sand Key estimate is based on increase in parking of about 10 percent with widening of Gulf Boulevard (626 spaces).

16. Tourist Facilities. Clearwater Beach Island, Sand Key, Treasure Island, and Long Key have all been intensely developed to accommodate residential housing and hotel/motel facilities. The 1981 Florida Statistical Abstract indicates the following: 3,640,000 tourist stayed in Pinellas County in 1979; as of July 1980 there were 714 hotel/motels in Pinellas County providing 21,186 living units; and 63.8 percent of tourists arriving in Florida by air stayed in hotel/motel units, while 50.3 percent of tourists arriving in Florida by automobile stayed in hotel/motel units. As the gulf islands contain many of the hotel/motel units listed for Pinellas County, the walk-on beach demand associated with these tourist facilities must be included.

17. The following method was used to allocate walk-on beach use associated with hotel/motels:

a. The percentage of hotel/motel units by municipality was determined using data from the American Automobile Association and aerial photographs.

b. Review of aerial photographs was used to determine the percentage of hotel/motels using public versus private beach area.

c. These percentages were multiplied times the total units listed for Pinellas County (21,186) to determine the units by island segment.

d. Occupancy is two persons per unit and 95 percent occupancy on peak day.

e. It is assumed all persons occupying gulf island hotel/motels will visit the beach one time each day.

A summary of this method is shown in table D-3.

18. Residential Facilities. As mentioned in paragraph 17, Clearwater Beach Island, Sand Key, Treasure Island, and Long Key have been highly developed in residential housing. The convenience of having the beach within walking distance provides a large residential walk-on demand. This demand is recognized as important; however, the data needed to calculate this demand has not been developed at this time.

Beach Capacity

19. Table D-4 summarizes available public beach capacity based on facilities and areas with and without the project implemented. This table also indicates the limiting factor for each island. Tables D-5 and D-6 summarize the capacity over the project life in 10-year increments. The "without" project condition is summarized in table D-5. The "without" project capacity is based on existing conditions and assumes capacity will decrease with continued erosion and assuming no further maintenance of completed Federal project shores as indicated on table D-1.

TABLE D-3

SUMMARY OF HOTEL/MOTEL UNITS
PINELLAS COUNTY

Location	Units in Pinellas County: Percent On Gulf Islands	Units in Pinellas County: Percent On Public Beach	Units in Pinellas County: No.	Peak Day: Occupancy 1/	Peak Day: Capacity 2/
Clearwater Beach Island	22.4	100	4,746	9,017	9,017
Sand Key	7.6	100	1,610	3,059	3,059
Treasure Island	10.4	100	2,203	4,186	4,186
Long Key	17.6	100	3,729	7,085	7,085
Total Gulf-front Units	58.0	100	12,288	23,347	23,347
Total County Units	100.0	-	21,186	40,253	-
Walk-on Capacity	58.0	100	12,288	23,347	23,347

1/ Peak day occupany based on 95 percent occupancy with two persons per unit.
2/ Capacity based on one visit per occupant per day.

TABLE D-4
DAILY PUBLIC BEACH CAPACITY

Location	Alternative	1985 Beach Area W/Project (1,000 sq.ft.)	1985 Beach Capacity Unlimited 1/ (1,000 visits)	1985 Beach Capacity Limited 2/ (1,000 visits)	1985 Beach Capacity Without Project
Honeymoon Island (4500')	20-foot	631	12.6	12.0	3.6
	40-foot	720	14.4	12.0	
	65-foot	834	16.7	12.0	
	100-foot	991	19.8	12.0	
Caladesi Island (3600')	20-foot	888	17.8	3.0	3.0
	40-foot	960	19.2	3.0	
	65-foot	1050	21.0	3.0	
	100-foot	1176	23.5	3.0	
Clearwater Beach Island (5000')	20-foot	1296	25.9	25.9	14.9
	40-foot	1346	26.9	25.9	
	65-foot	1471	29.4	25.9	
	100-foot	1646	32.9	25.9	
Sand Key (41700')	20-foot	5322	106.4	55.1	23.0
	40-foot	6156	123.1	55.1	
	65-foot	7198	144.9	55.1	
	100-foot	8658	173.2	55.1	
Treasure Island (9200')	Continued Nourishment	2474	49.5	14.4	14.4 3/
Long Key (5000)	Continued ourishment	1660	33.2	22.4	21.2
Mullet Key (6700')	Continued Nourishment	1088	21.8	21.8	16.4
North Shore Park	Section 103	--	--	3.7	3.7
Howard Park	County	--	--	12.4	12.4

1/ Based on 100 sq. ft. per person with a turnover of 2.
2/ Sum of parking and tourist facilities from tables D-2 and D-3.
3/ Treasure Island limited by parking with and without project.

TABLE D-5

MAXIMUM DAILY CAPACITY
WITHOUT PROJECT
(Units of 1,000 visitors)

Island/Location	YEAR 1985	1995	2005	2015	2025	2035
Honeymoon Island	3.6	2.9	2.3	1.6	0.9	0.2
Caladesi 1/	3.0	3.0	3.0	3.0	3.0	3.0
Clearwater Beach	14.9	14.5	14.0	13.5	13.1	12.6
Sand Key	23.0	11.4	0	0	0	0
Treasure Island 2/	14.4	14.4	14.4	14.4	14.4	14.4
Long Key	21.2	20.2	19.1	18.0	16.9	15.8
Mullet Key	16.4	10.8	5.3	0	0	0
North Shore Park	3.7	1.9	.1	0	0	0
Howard Park 3/	12.4	12.4	12.4	12.4	12.4	12.4
Total w/o Capacity	112.6	91.5	70.6	62.9	60.7	58.4

1/ Caladesi is limited by design to max. 3,000 visits/day.
2/ Parking and walk-on facilities limit Treasure Island to 14,400 visits per day.
3/ Howard Park is assumed maintained by county sources.

TABLE D-6

MAXIMUM DAILY CAPACITY
WITH PROJECT
(Units of 1,000 visitors)

Island/Location	YEAR 1985	1995	2005	2015	2025	2035
1. Total Capacity wo/project	112.6	91.5	70.6	62.9	60.7	58.4
Additional Capacity with:						
2. Honeymoon Island	8.4	9.1	9.7	10.4	11.1	11.8
3. Caladesi Island	0	0	0	0	0	0
4. Clearwater Beach Island	11.0	11.4	11.9	12.4	12.8	13.3
5. Sand Key	32.1	43.7	55.1	55.1	55.1	55.1
6. Treasure Island	0	0	0	0	0	0
7. Long Key	1.2	2.2	3.3	4.4	5.5	6.6
8. Mullet Key	5.4	11.0	16.5	21.8	21.8	21.8
9. Total Project Capacity (#1, 2, 3, 4, 5, 6, 7, & 8)	170.7	168.9	167.1	167.0	167.0	167.0

20. The "with" project condition is summarized by island segment on table D-6. This table lists total existing capacity for the entire county and new recreation capacity by island segment. The new capacity value was determined from the limiting capacity from table D-4 less the existing capacity from table D-5 for each segment. As noted from table D-4, limiting capacity is the same for the various berm widths.

RECREATION DEMAND

Annual Demand

21. The annual beach activity demand for Pinellas County was computed utilizing data from a statistical survey conducted by the State of Florida, the results of a count of visitors on the county beaches, and annual attendance to two beach parks: Howard Park and Redington Shores Park. These parks are located on the gulf coast of Pinellas County.

22. The method described in this paragraph was used to obtain a beach visitor count for Pinellas County. On 5 and 6 September 1982, several public beaches in Pinellas County were counted to determine the number of people on the beach. This information is presented on table D-7 and the beaches indicated on figure D-1. The beach count at Redington Shores Park was compared with an attendance record kept by the county for this same park. The following information was noted:

Date	COE Park Count	Attendance County Park	Ratio
5 Sept	446	3465	7.8
6 Sept	311	2418	7.8

In general, a turnover rate of 2 is associated with beach use. However, beach use varies during the day from a low to a peak to a low at day's end. This accounts for the seemingly high turnover rate of 7.8. The counted beaches were expanded to encompass the existing length of public shorefront in Pinellas County. The estimated length of public shorefront (8,300 feet) where beach counts were made on September 5, 1982, was compared to the number of persons counted (5,228 people) that same day to determine the average number of people per linear front-foot of public shoreline, or 0.630 persons/ft. The estimate of existing public shorefront in Pinellas County was then determined to be 150,884 feet as shown below:

EXISTING PUBLIC SHOREFRONT
PINELLAS COUNTY (1982)

Location	Accessible Length	Notes
Howard Park	15,840	Total length
Honeymoon Island	5,530	Southern portion only
Caladesi Island	---	Limited to 3,000 persons daily
Clearwater Beach	12,760	Total length
Sand key	58,294	Total length
Treasure Island	16,610	Total length
Long Key	20,650	21,420 less 770 seawalled
Mullet Key	21,120	Total length
TOTAL	150,824	

TABLE D-7
1982 PINELLAS COUNTY BEACH COUNT 1/

DATE	BEACH	TYPE	LOCATION	PARKING PUBLIC	PARKING CAPACITY MET	PARKING COST/HR	NO. OF TAGS OUT-OF-STATE	TIME OF DAY	APPROX LENGTH	NO. OF PEOPLE
9/5	Pass-A-Grille	City	S. Long Key	Yes	Full	$0.25	2/25	1:00 pm	5250'	2040
9/6	" "	"	"	"	½ Full	"	1/25	10:00 am	"	440
9/5	Upham Beach	City	Mid-Long Key	Yes	Full	"	NA	2:00 pm	750'	509
9/6	" "	"	"	"	1/3 Full	"	NA	11:00 am	"	374
9/5	Redington Shores Beach	County	Mid-Sand Key	Yes	Full	No Charge	3/20	3:00 pm	300'	446
9/6	"	"	"	"	½ Full	"	1/25	12:05 pm	"	311
9/5	Clearwater Beach	City	Clearwater Beach Island	Yes	Full	$0.25/hr + 15 min	16/100	4:00 pm	2000'	2233
9/6	" "	"	"	"	"	"	NA	12:30 pm	"	2400 2/
9/6	Madeira Beach Access	City	S. Sand Key	Yes	Full	No Charge	1/25	11:30 am	500'	182
9/6	Ben Davis Municipal Beach	City	Hillsborough County	Yes	2/3 Full	No Charge	NA	1:30 pm	2000'	310
9/6	Treasure Island Beach	City	Treasure Island	Yes	1/3 Full	$0.25	1/25	11:45 am	1000'	500 2/

1/ Weather Conditions: 9/5/82 - Clear, Hot; 9/6/82 - Very Cloudy, Breezy

2/ Estimate of people.

The estimated number of people on all Pinellas County beaches on September 5, 1982, was then estimated to be 95,000 people (150,824 x 0.63). This is less than the total 1982 beach capacity of 141,300 persons. A check on the 0.63 persons/ft. can be made by comparing extrapolated attendance to recorded attendance. As noted in the summary below, the extrapolated attendance is between 2 to 11 percent of the recorded attendance.

Location	Length a (ft)	Persons/ft (b)	Extrapolated Attendance a x b = c	Recorded Attendance d	Date (1982)	$\frac{d}{c}$
Mullet Key	22,120	0.63	13,936	15,480	9/5	1.11
				14,788	9/6	1.06
Howard Park	15,840	0.63	9,979	10,185	9/5	1.02
				10,623	9/6	1.06

The annual beach attendance was then determined by equating this attendance (95,000) with the ratio of annual park attendance to daily attendance for Redington Shores Beach Access Park as shown below:

$$\text{Annual County Demand} = 19{,}156{,}000 \text{ visitors} = \frac{95{,}000 \times 698{,}700}{3{,}465}$$

where 95,000 = estimated county wide attendance on 9/5/82

698,700 = Redington Shores Beach Access Park annual attendance 1982

3,465 = Redington Shores Beach Access Park daily attendance on 9/5/82

23. The previous procedure gives an estimate of the annual demand for 1982. However, the procedure does not lend itself to providing information concerning future beach activity demand or the origin of the beach visitors. These two items were developed by coupling the annual county demand determined as discussed in paragraph 22 with the data provided by a statistical report which was conducted by the State of Florida. This data is comprised of information concerning outdoor recreation activities contained on about 11,000 questionnaires and information collected from entrance points to the State. Utilizing these data, the annual beach activity demand was determined utilizing the following relations:

$$CD = (PcNc + PsNs + PtNt)\ K = 13{,}561{,}000$$

CD = County beach activity demand
Pc = Constant from State survey = participation rate by county residents
Ps = Constant from State survey = participation rate of residents from other Florida counties who recreate on Pinellas County beaches

Pt = Constant from State survey = participation rate tourist to Pinellas County
Nc = County resident population
Ns = State population
Nt = County tourist population
K = Constant for adjusting calculated demand to reflect actual counted beach visits. The calculated demand for 1982 (13,561,000) assumed K = 1.0. The demand for 1982 based on beach count data was 19,156,000. The K factor used in projecting future demand was 19,156,000 ÷ 13,561,000 or 1.41.

24. Based on the previous equation, the annual beach activity demand for Pinellas County would be as summarized on table D-8.

Daily Demand

25. Historical patterns of beach use along the gulf coast of Florida are characterized by user groups. These groups define how annual participation occurs within a given year. Daily attendance within the year reflects the climate or season which affects monthly participation. Daily attendance is also influenced by weekdays and weekends. Daily attendance records have been kept at Redington Shores Beach Park in Pinellas County and these were selected for an analysis of the patterns of beach use.

26. User groups were derived by ranking attendance records in descending order. Each day's attendance was divided by the attendance for the year to determine the percentage of yearly participation attributable to that day. To reduce the number of groups and simplify the computational process, groups with similar percentages were averaged. The net result was nine user groups representing 365 days in the year. These user groups are shown in table D-9. For example, the records indicate that user group no. 1 consists of three Sundays in June and July. This would be considered a peak-day category.

27. Daily beach activity demand by user group for the county beaches is summarized in table D-10. The values shown in this table were computed by applying the annual demands shown in table D-8 to the percentages listed in table D-9. This computation distributes the annual demand into use patterns based on historical data for the study area. For example, in 1985 a peak-day demand for Pinellas County beaches would be 177,000 visitors; a nonpeak-day demand would be 12,000 visitors.

Without Project Use

28. Total annual visits to the county beaches were computed considering the limits on daily capacities of the beaches to be as specified in table D-5.

These calculations are summarized on table D-11. The values on this table represents the product of the daily demand shown on table D-10 and the number of days shown on table D-9 limited by the carrying capacity of the existing county beaches.

With Project Use

29. Using the previously discussed procedure, recreational use of the county's beaches with the total project implemented was computed as shown on table D-12. This procedure assumes all beaches fill to capacity at the same rate. However, this procedure does not allocate recreational use by segment. In order to evaluate recreational use by segment the following procedure was used. The "without" segment condition was assumed to include all existing beaches and all implemented project segments except the segment under consideration. The maximum daily capacity values used for this analysis are listed in table D-13. The "with" segment condition would be the added project segment. The "with" condition will be equal to the total daily capacity of the implemented project as noted in item 8, on table D-13. Again, annual visits for each "without" condition were computed based on the limits of daily capacities specified in table D-13. The annual visitations for each without condition are listed on table D-14, D-15, D-16, D-17, & D-18 for the indicated segment. It should be noted that the Caladesi and Treausre Island segments were not evaluated due to limited access as shown on table D-4.

30. Visitors attributed to considered works. Beach visitors attributed to each of the considered alternatives were computed as the difference between the total county beach attendance with the considered works in place and without the considered works in place. The results of these analyses are summarized in tables D-18a and 18b.

TABLE D-8

ANNUAL BEACH ACTIVITY DEMAND

YEAR	PARTIC 2/ RATE1 (Pc)	COUNTY 2/ RESIDENTS (Nc)	PARTIC 2/ RATE2 (Ps)	STATE 2/ RESIDENTS (Ns)	PARTIC 3/ RATE3 (Pt)	COUNTY 3/ TOURISTS (Nt)	ANNUAL 4/ DEMAND (CD)
1985.	3.57	796.0	0.05	11084.0	2.60	4577.0	21720.5
1995.	3.57	934.0	0.05	13463.0	2.60	5581.0	26295.7
2005.	3.57	1064.0	0.05	15480.0	2.60	6731.0	31343.8
2015.	3.57	1175.0	0.05	17092.0	2.60	7881.0	36266.7
2025.	3.57	1274.0	0.05	18539.0	2.60	9032.0	41120.8
2035.	3.57	1374.0	0.05	19987.0	2.60	10182.0	45976.4

1/ POPULATIONS AND DEMAND IN UNITS OF 1,000.

2/ FROM SCORP DATA BASE SUMMARIZED BY COUNTY

3/ FROM STATE OF FLORIDA TOURIST BUREAU

4/ CD = (PcNc + PsNs + PtNt)K   where K is 1.41

TABLE D-9

USER GROUP CATEGORIES

REDINGTON SHORES BEACH COUNT

RANK	NO. DAYS IN GROUP	AVERAGE DAILY ATTENDANCE	AVERAGE DAILY % OF TOTAL (IN %)
1	3	2419.67	0.815
2	3	2063.67	0.695
3	12	1770.33	0.596
4	17	1486.65	0.501
5	47	1214.06	0.409
6	83	911.01	0.307
7	105	627.40	0.211
8	87	360.82	0.122
9	5	157.30	0.053

TABLE D-10
DAILY BEACH ACTIVITY DEMAND
(UNITS OF 1,000)

USER GROUP	1985	1995	2005	2015	2025	2035
1	177.	214.	255.	296.	335.	375.
2	151.	183.	218.	252.	286.	320.
3	129.	157.	187.	216.	245.	274.
4	109.	132.	157.	182.	206.	230.
5	89.	108.	128.	148.	168.	188.
6	67.	81.	96.	111.	126.	141.
7	46.	55.	66.	77.	87.	97.
8	26.	32.	38.	44.	50.	56.
9	12.	14.	17.	19.	22.	24.

TABLE D-11

ANNUAL BEACH VISITS WITHOUT PROJECT

(UNITS OF 1,000)

USER GROUP	YEAR 1985	1995	2005	2015	2025	2035
1	338.	275.	212.	189.	182.	175.
2	676.	549.	424.	377.	364.	350.
3	1351.	1098.	847.	755.	728.	701.
4	1850.	1556.	1200.	1069.	1032.	993.
5	4175.	4301.	3318.	2956.	2853.	2745.
6	5535.	6700.	5860.	5221.	5038.	4847.
7	4812.	5826.	6944.	6604.	6373.	6132.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21100.	23164.	22215.	21117.	21045.	20945.

TABLE D-12

ANNUAL BEACH VISITS - WITH PROJECT
ALL SEGMENTS

(UNITS OF 1,000)

USER GROUP	1985	1995	2005	2015	2025	2035
1	512.	507.	501.	501.	501.	501.
2	906.	1013.	1003.	1002.	1002.	1002.
3	1553.	1881.	2005.	2004.	2004.	2004.
4	1850.	2240.	2670.	2839.	2839.	2839.
5	4175.	5055.	6025.	6972.	7849.	7849.
6	5535.	6700.	7987.	9241.	10478.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21706.	26082.	30545.	34539.	38257.	41098.

TABLE D-13

MAXIMUM DAILY CAPACITY
INCREMENTAL IMPLEMENTATION 1/
(Units of 1,000 visitors)

Alternative	YEAR 1985	1995	2005	2015	2025	2035
Total Capacity All Segments Except:						
1. Honeymoon Island	162.3	159.8	157.4	156.6	155.9	155.2
2. Caladesi Island	170.7	168.9	167.1	167.0	167.0	167.0
3. Clearwater Beach Island	159.7	157.5	155.2	154.6	154.2	153.7
4. Sand Key	138.6	125.2	112.0	111.9	111.9	111.9
5. Treasure Island	170.7	168.9	167.1	167.0	167.0	167.0
6. Long Key	169.5	168.9	163.8	162.6	161.5	160.4
7. Mullet Key	165.3	157.9	150.6	145.2	145.2	145.2
8. Total Capacity Project	170.7	168.9	167.1	167.0	167.0	167.0

1/ Last added basis

TABLE D-14

ANNUAL BEACH VISITS
HONEYMOON ISLAND
LAST ADDED

ANNUAL BEACH VISITS - EXISTING CONDITIONS
(UNITS OF 1,000)

USER GROUP	YEAR 1985	1995	2005	2015	2025	2035
1	[illegible]	[illegible]	[illegible]	470.	468.	466.
2	906.	[illegible]	944.	940.	935.	931.
3	1553.	1881.	1889.	1879.	1971.	1862.
4	1850.	2240.	2670.	2662.	2650.	2638.
5	4175.	5055.	6025.	6972.	7327.	7294.
6	5535.	6700.	7987.	9241.	10479.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	93.	96.	109.	122.
TOTAL	21691.	26000.	30341.	34144.	37313.	40095.

ANNUAL BEACH VISITS - WITH PROJECT
(UNITS OF 1,000)

USER GROUP	YEAR 1985	1995	2005	2015	2025	2035
1	512.	507.	501.	501.	501.	501.
2	906.	1013.	1003.	1002.	1002.	1002.
3	1553.	1881.	2005.	2004.	2004.	2004.
4	1850.	2240.	2670.	2839.	2839.	2839.
5	4175.	5055.	6025.	6972.	7849.	7849.
6	5535.	6700.	7987.	9241.	10479.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21706.	26082.	30545.	34539.	38257.	41098.

TABLE D-15

ANNUAL BEACH VISITS
CLEARWATER BEACH ISLAND
LAST ADDED

ANNUAL BEACH VISITS - EXISTING CONDITIONS
(UNITS OF 1,000)

USER GROUP			YEAR			
	1985	1995	2005	2015	2025	2035
1	[illegible]	[illegible]	466.	464.	463.	461.
2	906.	945.	931.	929.	925.	[illegible]
3	[illegible]	1881.	[illegible]	1855.	1950.	1944.
4	1850.	2240.	2638.	2628.	[illegible]	2613.
5	4175.	5055.	6025.	6972.	7247.	7224.
6	5535.	6700.	7987.	9241.	10479.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	[illegible]	70.	83.	96.	109.	122.
TOTAL	21673.	25990.	30264.	34068.	37169.	39968.

ANNUAL BEACH VISITS - WITH PROJECT
(UNITS OF 1,000)

USER GROUP			YEAR			
	1985	1995	2005	2015	2025	2035
1	512.	507.	501.	501.	501.	501.
2	906.	1013.	1003.	1002.	1002.	1002.
3	1553.	1881.	2005.	2004.	2004.	2004.
4	1850.	2240.	2670.	2839.	2839.	2839.
5	4175.	5055.	6025.	6972.	7849.	7849.
6	5535.	6700.	7987.	9241.	10478.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21706.	26082.	30545.	34539.	38257.	41098.

TABLE D-16

ANNUAL BEACH VISITS
SAND KEY - LAST ADDED

ANNUAL BEACH VISITS - EXISTING CONDITIONS
(UNITS OF 1,000)

USER GROUP	YEAR 1985	1995	2005	2015	2025	2035
1	416.	376.	336.	336.	336.	336.
2	832.	751.	672.	671.	671.	671.
3	1553.	1502.	1344.	1343.	1343.	1343.
4	1850.	2129.	1904.	1902.	1902.	1902.
5	4175.	5055.	5264.	5259.	5259.	5259.
6	5535.	6700.	7987.	9241.	9288.	9288.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21536.	25199.	27861.	30733.	32383.	33987.

ANNUAL BEACH VISITS - WITH PROJECT
(UNITS OF 1,000)

USER GROUP	YEAR 1985	1995	2005	2015	2025	2035
1	512.	507.	501.	501.	501.	501.
2	903.	1013.	1003.	1002.	1002.	1002.
3	1553.	1881.	2005.	2004.	2004.	2004.
4	1850.	2240.	2670.	2839.	2839.	2839.
5	4175.	5055.	6025.	6972.	7849.	7849.
6	5535.	6700.	7987.	9241.	10478.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21706.	26082.	30545.	34539.	38257.	41098.

TABLE D-17

ANNUAL BEACH VISITS
LONG KEY - LAST ADDED

ANNUAL BEACH VISITS - EXISTING CONDITIONS
(UNITS OF 1,000)

USER GROUP	YEAR 1985	1995	2005	2015	2025	2035
1	509.	507.	491.	488.	485.	481.
2	906.	1013.	983.	976.	969.	962.
3	1553.	1881.	1966.	1951.	1938.	1925.
4	1850.	2240.	2670.	2764.	2746.	2727.
5	4175.	5055.	6025.	6972.	7591.	7539.
6	5535.	6700.	7987.	9241.	10478.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21703.	26082.	30475.	34372.	37789.	40537.

ANNUAL BEACH VISITS - WITH PROJECT
(UNITS OF 1,000)

USER GROUP	YEAR 1985	1995	2005	2015	2025	2035
1	512.	507.	501.	501.	501.	501.
2	906.	1013.	1003.	1002.	1002.	1002.
3	1553.	1881.	2005.	2004.	2004.	2004.
4	1850.	2240.	2670.	2839.	2839.	2839.
5	4175.	5055.	6025.	6972.	7849.	7849.
6	5535.	6700.	7987.	9241.	10478.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21706.	26082.	30545.	34539.	38257.	41098.

TABLE D-18

ANNUAL BEACH VISITS
MULLET KEY - LAST ADDED

ANNUAL BEACH VISITS - EXISTING CONDITIONS
(UNITS OF 1,000)

USER GROUP	YEAR 1985	1995	2005	2015	2025	2035
1	496.	474.	452.	436.	436.	436.
2	906.	947.	904.	871.	871.	871.
3	1553.	1881.	1807.	1742.	1742.	1742.
4	1850.	2240.	2560.	2469.	2469.	2469.
5	4175.	5055.	6025.	6824.	6824.	6824.
6	5535.	6700.	7987.	9241.	10478.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21690.	25983.	30099.	33563.	36404.	39245.

ANNUAL BEACH VISITS - WITH PROJECT
(UNITS OF 1,000)

USER GROUP	YEAR 1985	1995	2005	2015	2025	2035
1	512.	507.	501.	501.	501.	501.
2	906.	1013.	1003.	1002.	1002.	1002.
3	1553.	1881.	2005.	2004.	2004.	2004.
4	1850.	2240.	2670.	2839.	2839.	2839.
5	4175.	5055.	6025.	6972.	7849.	7849.
6	5535.	6700.	7987.	9241.	10478.	11715.
7	4812.	5826.	6944.	8035.	9110.	10186.
8	2305.	2791.	3327.	3849.	4365.	4880.
9	58.	70.	83.	96.	109.	122.
TOTAL	21706.	26082.	30545.	34539.	38257.	41098.

TABLE D-18A

RECREATIONAL USE ATTRIBUTED TO PROJECT
LAST ADDED INCREMENT 1/

Last Added Segment	YEAR 1985	1995	2005	2015	2025	2035
Honeymoon	25	82	204	395	944	1003
Caladesi	0	0	0	0	0	0
Clearwater Beach	33	102	281	471	1088	1130
Sand Key	170	883	2684	3806	5874	7111
Treasure Island	0	0	0	0	0	0
Long Key	3	0	70	167	468	561
Mullet Key	16	99	456	976	1853	1853
Sum Total	247	1166	3695	5815	10227	11658
All segments implemented as a whole	606	2918	8330	13422	17212	20153

1/ Units of 1,000 visits.

VALUE OF BEACH VISIT

31. The travel cost method was used to determine the value of a beach visit. The basic premise of the travel cost method (TCM) is that the per capita use of a recreation site will decrease as the out-of-pocket and time cost of traveling from place of origin to site increases. The value of a beach visit would be determined by dividing the area under the Cost of Travel vs. Beach Activity Demand Curve by the total annual demand. The procedures which comprise the analysis are listed below and discussed in the following paragraphs.

a. Considering the Pinellas County gulf coast as mile 0, establish 6-mile-wide origin zones that lie equal distance to the coast.

b. Establish population of each zone.

c. Establish per capita beach use rate in each zone.

d. Establish mean round trip distance for each zone and establish a per capita use relationship (per capita participation rate vs. mean round trip travel distance).

e. Compute travel and opportunity costs per person for each zone for a given trip.

f. Adjust travel and opportunity costs for round trip distance and compute "e" on a per mile basis for each zone.

g. Average values in each zone computed in "f" and equate to a price per person per mile.

h. Calculate total demand from all zones as point on price - demand curve where price equal 0.0.

i. Simulate moving the Pinellas County gulf coast seaward using 10-mile increments.

j. For each simulation estimate per capita participation from the per capita use relationship and compute estimated demand for each zone.

k. For each simulation plot price vs. demand on a composite demand curve.

l. Estimate value of a beach visit by dividing the area under the curve developed by step i, j, and k by the total demand.

Origin Zones

32. Selection of the origin zones was based on the unique geography of the Tampa Bay Region in which Pinellas County is located (figure D-3). An area with radius of 48-miles was selected to keep the oneway travel time within 1 hour in keeping with day users. In addition to Pinellas County, major portions of Hillsborough, Pasco, and Manatee Counties are included in this area. Pasco and Hillsborough Counties were included in the mapping of origin zones due to lack of recreational beach in either county. Manatee County was eliminated from further consideration because several recreational beaches are located within its boundaries and to reach Pinellas County it would be necessary to use the toll road across the entrance to Tampa Bay.

33. Considering the Pinellas County ocean beach area as mile 0, eight 6-mile-wide origin zones lying equidistant to the nearest beach area were plotted on a large scale county map. The equidistance of the zones was maintained by drawing circles whose radius increased by 6-mile increments. The circles originate from the gulf beach area fronting the most direct access route from the mainland to the barrier island beaches. These access routes consists of the following causeways from north to south: Howard Park, Memorial, Bellair, SR 694, Welch, Treasure Island, Corey, and SR 682. For better population grouping definition, each of the 6-mile-wide zones was subdivided into 2-mile-wide subzones which correspond to the Inner (I), Middle (M), and Outer (O) with respect to location within the zone.

Population Distribution

34. The population in each zone was established by using block statistics derived from the U.S. Department of Commerce 1980 Census of Housing for Hillsborough, Pasco, and Pinellas Counties, Florida. The methodology used to establish population groupings was as follows:

a. The tract numbers were identified and located on the master map.

b. The zone and zip codes in which these tracts were located were noted along with the population from each tract.

c. A compilation was made for each major zone by subzone. The tract population for each subzone per zip code was established. The compilation is summarized in tables D-19, D-20, and D-21.

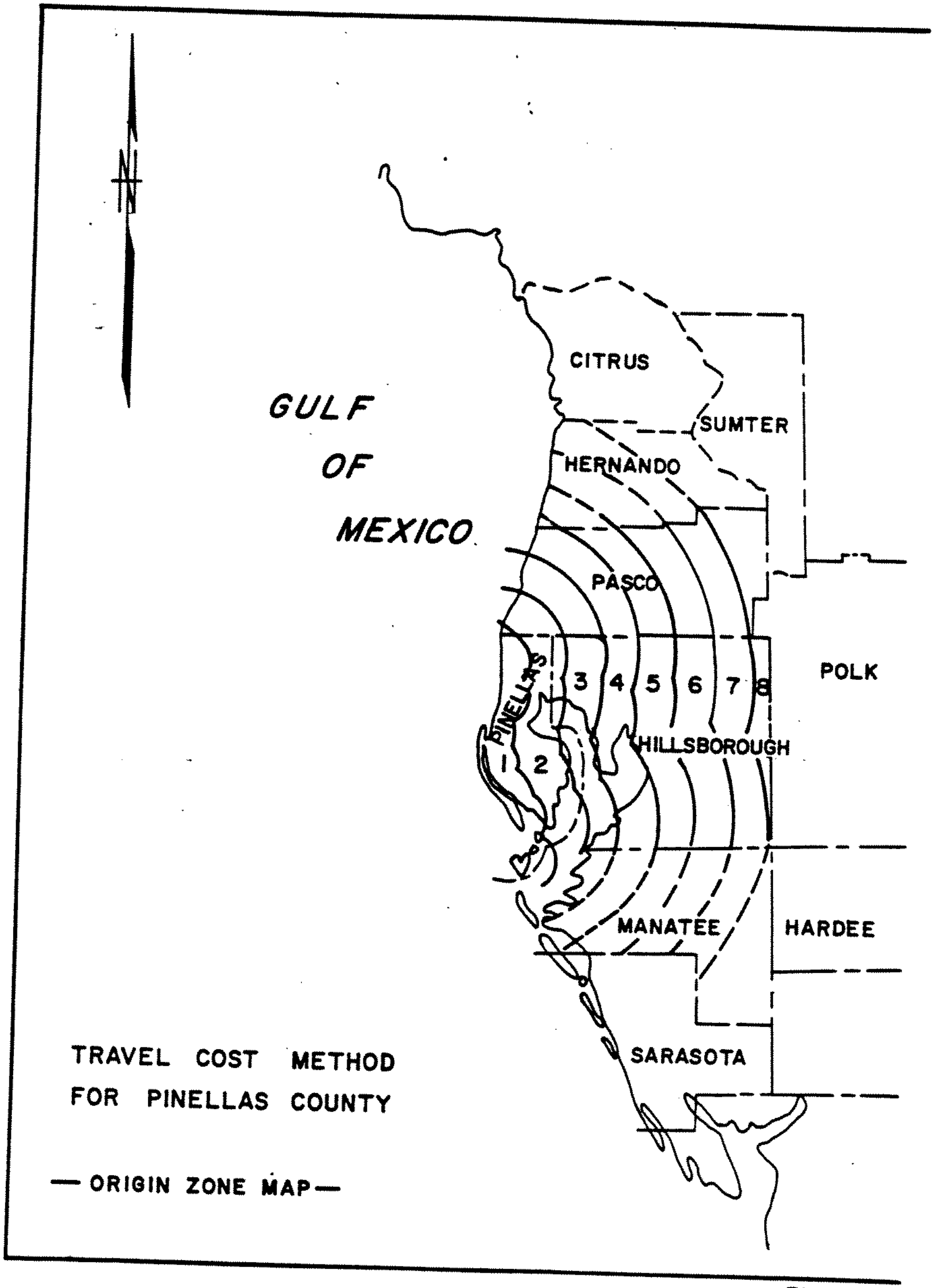

GULF
OF
MEXICO
CITRUS
SUMTER
HERNANDO
PASCO
PINELLAS
POLK
HILLSBOROUGH
MANATEE
HARDEE
SARASOTA
1
2
3
4
5
6
7
8
N
TRAVEL COST METHOD
FOR PINELLAS COUNTY
— ORIGIN ZONE MAP —

FIGURE D-3

TABLE D-19
PINELLAS COUNTY BEC
POPULATION BY SUBZONE
HILLSBOROUGH COUNTY

ZONE NO.	ZIPCODE	SUBZONE INNER	MIDDLE	POPULATION OUTER
1				
TOTAL		0.	0.	0.
2				
TOTAL		0.	0.	0.
3	33608	0.	0.	5406.
	33621	0.	0.	55.
	33616	0.	3715.	3715.
	33611	0.	0.	14591.
	33614	0.	0.	24070.
	33624	5693.	5693.	5693.
	33515	14698.	14698.	0.
	33586	2440.	2440.	2513.
	33570	0.	0.	2853.
TOTAL		22831.	26546.	58896.
4	33611	14591.	0.	0.
	33609	16170.	16170.	0.
	33606	0.	14147.	0.
	33602	0.	0.	11210.
	33607	15228.	15228.	0.
	33614	24070.	0.	0.
	33603	0.	10332.	10332.
	33605	0.	0.	8301.
	33604	0.	9991.	9991.
	33619	0.	0.	4681.
	33618	10124.	0.	0.
	33612	0.	25352.	25352.
	33624	5693.	0.	0.
	33570	2853.	2853.	2853.
	33534	0.	0.	3915.
	33549	0.	5192.	5192.
TOTAL		88729.	99265.	81827.
5	33605	8301.	0.	0.
	33610	12907.	12907.	13298.
	33604	10293.	0.	0.
	33620	2740.	0.	0.
	33617	10133.	10133.	10440.
	33619	4681.	4681.	4681.
	33534	3915.	3915.	3915.
	33569	2797.	2797.	2882.
	33503	0.	0.	2483.
	33598	0.	1781.	1781.
	33549	5192.	5192.	0.
TOTAL		60959.	41406.	39480.
6	33511	14179.	14179.	14609.
	33530	0.	0.	2150.
	33503	2483.	2558.	0.
	33598	1835.	0.	0.
	33550	9319.	0.	0.
	33584	0.	2639.	2639.
	33592	3416.	3416.	3520.
TOTAL		31232.	22792.	22918.
7	33527	7267.	0.	0.
	33566	0.	12662.	12662.
	33530	2150.	0.	0.
	33547	748.	748.	771.
TOTAL		10165.	13410.	13433.
8	33566	12662.	0.	0.
TOTAL		12662.	0.	0.

PINELLAS COUNTY BEC
POPULATION BY SUBZONE
PASCO COUNTY

ZONE NO.	ZIPCODE	SUBZONE INNER	MIDDLE	POPULATION OUTER
1				
TOTAL		0.	0.	0.
2				
	33590	0.	5489.	5489.
	33531	0.	0.	4466.
	33552	7655.	7655.	7887.
	33553	0.	0.	11721.
	33568	0.	0.	7947.
TOTAL		7655.	13144.	37510.
3				
	33556	1392.	1392.	1434.
	33589	5867.	5867.	6045.
	33531	4466.	0.	0.
	33553	11721.	12076.	0.
	33568	7714.	7947.	0.
TOTAL		31160.	27282.	7479.
4				
	33549	0.	379.	379.
	33539	0.	4015.	4015.
	33502	3462.	3462.	3567.
TOTAL		3462.	7856.	7961.
5				
	33576	0.	0.	1633.
	33549	379.	379.	0.
TOTAL		379.	379.	1633.
6				
	33576	1633.	1633.	1633.
	33574	0.	501.	501.
TOTAL		1633.	2134.	2134.
7				
	33593	0.	1360.	1360.
	33525	0.	4119.	4119.
	33599	7736.	7736.	7970.
	33524	0.	0.	651.
	33574	516.	0.	0.
TOTAL		8252.	13215.	14100.
8				
	33537	897.	897.	925.
	33525	4244.	0.	0.
TOTAL		5141.	897.	925.

PINELLAS COUNTY BEC
POPULATION BY SUBZONE
PINELLAS COUNTY

ZONE NO.	ZIPCODE	SUBZONE INNER	MIDDLE	POPULATION OUTER
1				
	33589	2968.	2968.	3057.
	33563	0.	0.	12098.
	33523	0.	2865.	0.
	33528	0.	15800.	15800.
	33515	15441.	15441.	15909.
	33516	24613.	24613.	0.
	33541	0.	0.	21370.
	33540	0.	53282.	0.
	33535	7836.	0.	0.
	33542	14243.	14243.	0.
	33543	0.	0.	7907.
	33565	0.	0.	17565.
	33504	2495.	0.	0.
	33708	18981.	0.	0.
	33709	0.	20217.	0.
	33714	0.	0.	5548.
	33713	0.	0.	17583.
	33710	0.	34295.	0.
	33706	18942.	0.	0.
	33707	0.	26610.	0.
	33711	0.	18120.	0.
	33712	0.	0.	24860.
	33705	0.	0.	16224.
	33715	0.	8982.	0.
	33560	0.	7745.	0.
TOTAL		105519.	245181.	157921.
2				
	33590	3503.	3503.	0.
	33563	12098.	0.	0.
	33557	0.	0.	2363.
	33572	0.	6075.	0.
	33519	15068.	0.	0.
	33520	8048.	0.	8048.
	33543	7907.	0.	0.
	33565	17565.	0.	0.
	33714	11266.	0.	0.
	33702	0.	15475.	15475.
	33703	0.	24428.	0.
	33704	0.	17703.	0.
	33713	17583.	0.	0.
	33701	11427.	11427.	0.
	33705	16224.	0.	0.
TOTAL		120689.	78611.	25886.
3				
TOTAL		0.	0.	0.
4				
TOTAL		0.	0.	0.
5				
TOTAL		0.	0.	0.
6				
TOTAL		0.	0.	0.
7				
TOTAL		0.	0.	0.
8				
TOTAL		0.	0.	0.

Zone Per Capita Use Rate

35. The participation rates for beach visitations in Pinellas County were obtained from a statistical survey made by the State of Florida. The total number of beach visitations or demand from each zone was calculated by multiplying the zip code participation rates by the number of people residing in that zip code within a given zone. The sum of these visitations per zip code were summated to obtain the total zone visitation. The total zone visitation when divided by the zone population gives the average zone participation rate.

36. It was determined that the average participation rate (APR) decreases for the first four zones and then increases in Zone 5 and decreases for Zones 6, 7, and 8. Since an implicit assumption of the travel cost methodology is that the APR decreases as the commuting distance from the project site increases, the following approach was used to sanitize the data. Zones 5, 6, 7, and 8 were combined to obtain a modified zone which was referred to as Zone 5M (see table D-22).

Travel Distance Computation

37. Travel distance is of paramount importance when using the travel cost method as a proxy for willingness to pay for a beach visit. The utilization of subzones allows the determination of a mean weighted average travel distance (MWATD) for each zone. The MWATD for each zone was calculated by first taking the distance from the centroid of each 2-mile-wide subzone and multiplying it by the subzone population. The number thus obtained for each subzone was summated for each zone (3 subzones) and this cumulative value was divided by the total zone population to obtain the MWATD. These distances, in miles, correspond to the following for zones 1 through 4. The same methodology was used to obtain the MWATD for zone 5M which equates to 64.32 miles.

38. A per capita utilization curve which relates per capita participation and travel distance was created by drawing a smooth curve through the average participation rates computed for the eight zones and their respective mean weighted round trip travel distances. A similar curve was drawn to include zone 5M. These curves are illustrated in figure D-4. A mean weighted round trip travel distance of 120 miles was determined as the point where no further day beach use could be expected when using the averaged zone 5M.

Cost of Travel

39. The cost of travel is comprised of the out-of-pocket travel cost and the opportunity cost of time.

40. The travel cost per mile is determined as an average variable cost per mile. These costs which were extraced from the U.S. Department of Transportation 1982 pamphlet are summarized in table D-23. As indicated, this cost was updated to 12.4 cents per mile to reflect January 1984 price levels.

TABLE D-22
PINELLAS COUNTY BEC
MEAN WEIGHTED AVERAGE TRAVEL DISTANCE (1)

ZONE NO.	SUBZONE NO.	SUBZONE POPULATION	ZONE POPULATION	ZONE PARTIC	DISTANCE ONEWAY	ONEWAY MWATD	RDTRIP MWATD
1	I	105899.	503082.	3.61	1.0	3.21	6.41
	M	239602.			3.0		
	O	157581.			5.0		
2	I	137422.	301506.	2.74	7.0	8.51	17.02
	M	100894.			9.0		
	O	63190.			11.0		
3	I	48359.	156227.	1.27	13.0	15.15	30.30
	M	47611.			15.0		
	O	60257.			17.0		
4	I	92229.	285294.	1.05	19.0	20.97	41.94
	M	105252.			21.0		
	O	87813.			23.0		
5	I	63406.	148118.	2.01	25.0	26.69	53.39
	M	44074.			27.0		
	O	40638.			29.0		
6	I	33035.	82801.	0.61	31.0	32.80	65.60
	M	25061.			33.0		
5M	O	24705.		.82	35.0	32.16	64.32
7	I	18494.	62913.	0.16	37.0	38.97	77.94
	M	26883.			39.0		
	O	17536.			41.0		
8	I	17859.	19673.	0.00	43.0	43.28	86.55
	M	907.			45.0		
	O	907.			47.0		

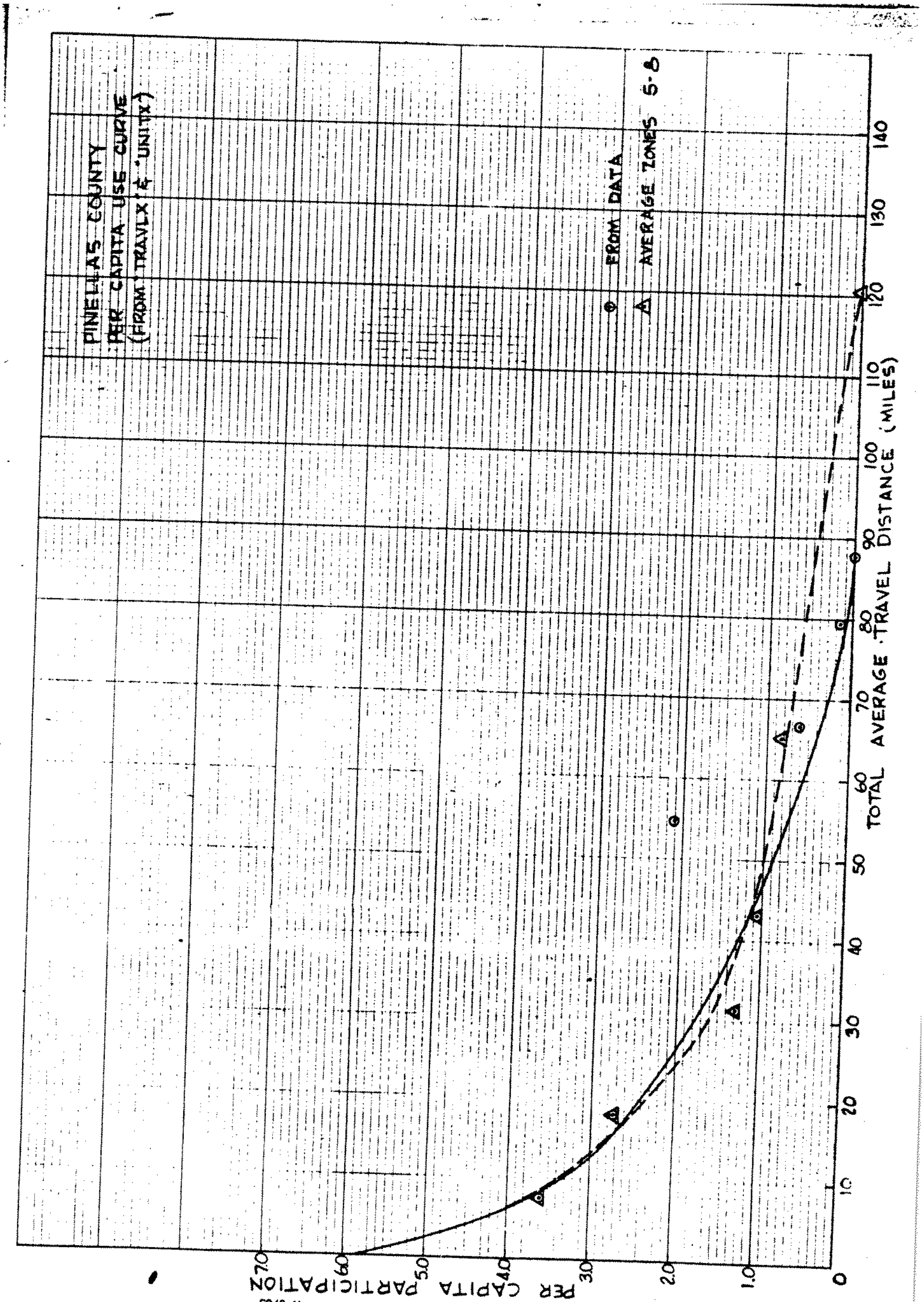

PINELLAS COUNTY
PER CAPITA USE CURVE
(FROM 'TRAVLX' & 'UNITX')
⊙ FROM DATA
△ AVERAGE ZONES 5-8
PER CAPITA PARTICIPATION
TOTAL AVERAGE TRAVEL DISTANCE (MILES)
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
47 0703

TABLE D-23

Average Variable Cost to Operate an Automobile 1/
(cents per mile)

1981 Variable Cost	Large	Inter-mediate	Compact	Subcompact	Average
Maintenance, Accessories, Parts, and Tires	6.0	5.6	5.0	4.8	5.4
Gasoline and Oil	7.3	6.6	5.3	4.5	5.9
Taxes on Gas, Oil, and Tires	1.5	1.3	1.1	1.0	1.2
Total 1979					12.5
1984 Variable Cost					
Maintenance, Accessories, Parts, and Tires 2/	6.5	6.1	5.4	5.2	5.8
Gasoline and Oil 3/	6.8	6.1	4.9	4.2	5.5
Taxes on Gas, Oil, and Tires 3/	1.4	1.2	1.0	0.9	1.1
Total 1984					12.4

1/ From 1982 U.S. Department of Transportation pamphlet.

2/Use transportation, private.

Jan 1984-June 1981
300.9 ÷ 277.9 = 1.083

3/Use fuels and related products.

Jan 1984-June 1981
655.8 ÷ 707.6 = 0.93

41. The opportunity cost of time is valued as one-third of the average hourly wage rate for adults and one-twelfth of the adult wage rate for children. The 1979 average wage rate of $6.94 was derived from information published in the 1981 Florida Statistical Abstract. The adult's opportunity cost of time is $2.31 (6.94 ÷ 3) and the children's opportunity cost of time is $0.58 cents (6.94 ÷ 12). As used elsewhere in this report, each automobile is occupied by four persons; considering a population comprised of 20.5 percent children and 79.5 percent adults, 1/ the average occupancy of each automobile would be comprised of 3.18 adults and 0.82 children. The weighted opportunity cost of time per hour per visitor would be $1.96 and would be computed as follows:

$$\frac{(0.82 \times \$.58) + (3.18 \times \$2.31)}{4} = \$1.96$$

1/ From Bulletin No. 66, Dec. 1983, Bureau of Economic and Business Research, University of Florida.

Adjusted Travel Cost

42. Based on the previous discussion and assuming an increasing average speed as the distance from the beach increases (more expressway travel), the total cost required to access the beach and return is given on table D-24. Notice that 1 mile has been added to the commuting distance to allow for parking.

43. The total cost of travel per beach visitor from the previously established origin zones as shown in table D-24 is summarized by the following equation:

Total Cost of Travel = Out-of-Pocket Cost + Opportunity Cost of Time

where,

$$\text{Out-of-Pocket Cost} = \frac{D \times CM}{4};$$

$$\text{Opportunity Cost of Time} = \frac{D \times CH}{V}; \text{ and}$$

D = total distance
CM = cost per mile
CH = cost per hour
V = velocity
4 = number of persons per vehicle.

Average Value of Travel

44. Values utilized for price which include travel cost and opportunity cost were converted to a price per person per mile for each zone by dividing the price per person by the weighted mean round trip distance in that zone. Price per person per mile computed for the five zones is 12.9¢, 9.6¢, 8.0¢, 7.0¢, and 7.0¢, respectively. The difference in these values is mainly attributable to different travel times reflected in opportunity cost. An average value of 8.9¢ was calculated for the five zones.

Value of Recreation

45. The travel cost method requires the analysis of small incremental increases in the price of participation to measure the quantity of use that would be demanded given these changes. This is equivalent to moving the project further and farther from the potential users, requiring them to pay more and more in travel costs. (An example of the calculations involved in this process is shown in table D-25).

46. A demand curve which relates the expected visitation at varying price levels was plotted. (This curve is shown in figure D-5.) The area under the

TABLE D-24
PINELLAS COUNTY BFC
UNIT VALUE OF TRAVEL

ZONE	MWAID (MI)	RDTRIP (MI)	PARKING (MI)	TOTAL DIST	$COST PER MI	$COST PER HR	VEL (MPH)	TOTAL COST	UNIT COST
1	3.21	6.42	1.0	7.42	.124	1.960	20.	0.957	0.129
2	8.54	17.08	1.0	18.08	.124	1.960	30.	1.742	0.096
3	15.14	30.28	1.0	31.28	.124	1.960	40.	2.502	0.080
4	20.98	41.96	1.0	42.96	.124	1.960	50.	3.016	0.070
5	32.16	64.32	1.0	65.32	.124	1.960	50.	4.585	0.070
								AVG COST/MI $	0.089

TABLE D-25
PINELLAS COUNTY BEC
DEMAND CURVE SIMULATION

DEMAND CURVE RELATIONSHIP CALCULATIONS
OF PRICE AND VISITATION USING A 10-MILE INTERVAL

0 MILES ADDITIONAL DISTANCE AT A $ 0.00 PRICE

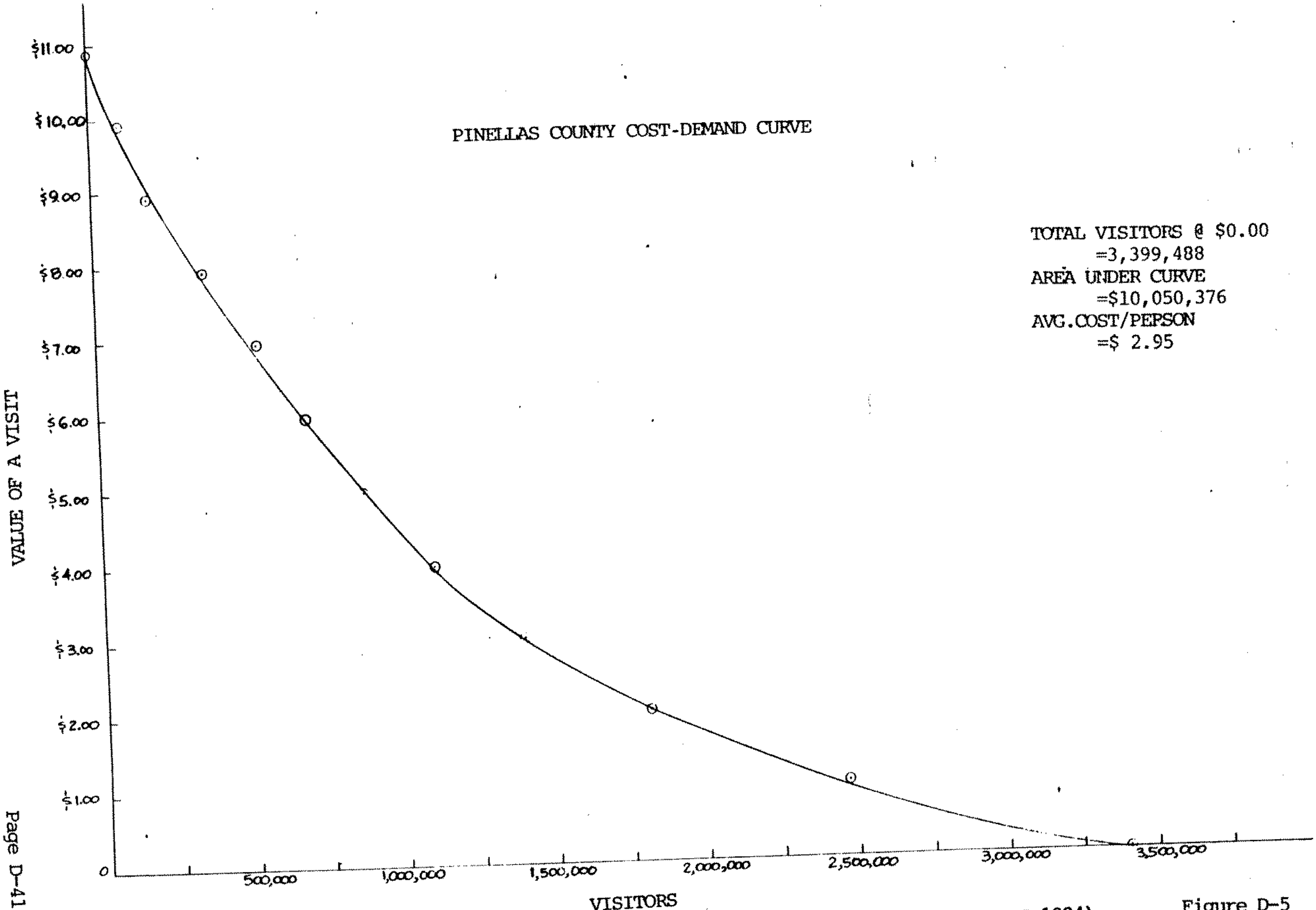
ZONE ORIGIN	POPULATION	DISTANCE (IN MILES)	VISITS PER CAPITA	ESTIMATED VISITATION
1	508621.	7.42	3.61	1836122.
2	283495.	18.08	2.74	776776.
3	174194.	31.28	1.27	221226.
4	289100.	42.96	1.05	303555.
5	319279.	65.33	0.82	261809.
			TOTAL	3399488.

10 MILES ADDITIONAL DISTANCE AT A $ 0.89 PRICE

ZONE ORIGIN	POPULATION	DISTANCE (IN MILES)	VISITS PER CAPITA	ESTIMATED VISITATION
1	508621.	17.42	2.57	1307156.
2	283495.	28.08	1.71	484776.
3	174194.	41.28	1.20	209033.
4	289100.	52.96	0.91	263081.
5	319279.	75.33	0.64	204339.
			TOTAL	2468385.

20 MILES ADDITIONAL DISTANCE AT A $ 1.78 PRICE

ZONE ORIGIN	POPULATION	DISTANCE (IN MILES)	VISITS PER CAPITA	ESTIMATED VISITATION
1	508621.	27.42	1.75	890087.
2	283495.	38.08	1.29	365709.
3	174194.	51.28	0.97	168968.
4	289100.	62.96	0.79	228389.
5	319279.	85.33	0.50	159640.
			TOTAL	1812792.



(REV. DEC 1984)

Figure D-5

curve represents the average value of the visits to the entire sample area. The computed value of these visits is $10,050,376. The average value per visit is computed by dividing this value by the total number of visits in the sample area (3,399,488). The average value per visit is $2.95. A value of $2.95 was used in this analysis.

CALCULATION OF RECREATION BENEFITS

47. Recreation benefits for each considered alternative was determined to be as summarized on table D-26. Benefits indicated on this table represent the product of the value of a visit ($2.95) and the visitors indicated on table D-18.

48. Average annual benefits attributable to the considered alternatives were computed by amortizing the present worth of the benefits attributable to the project over the 50-year period of analysis at 8 1/8 percent interest. The results of these calculations are summarized on table D-26.

TABLE D-26

SUMMARY OF RECREATION BENEFITS 1/
(Units of $1,000)

Alternative	1985	1995	2005	2015	2025	2035	A.A.E.B. 2/
Honeymoon Island	74	242	602	1165	2785	2959	467
Clearwater Beach Island	97	301	829	1389	3210	3334	578
Sand Key	502	2605	7918	11228	17328	20977	4481
Long Key	9	0	207	493	1381	1655	154
Mullet Key	47	292	1345	2879	5466	5466	891
Sum Total	729	3440	10901	17154	30170	34391	6571

1/ Based on average beach visit = $2.95, and a last added basis.
2/ Average Annual Equivalent Benefit, based on 50-year period at 8 1/8 percent.

PREVENTION OF DAMAGES

49. Damages or losses due to shore erosion include physical loss of land and loss of or damage to development features such as roads, buildings, and protective structures. Benefits which would result from the prevention of these damages are discussed in the following paragraphs.

BENEFITS FROM PREVENTION OF LOSS OF LAND

50. Within the study area, only Honeymoon and Caladesi Islands are unprotected and subject to direct loss of land. The remaining islands are generally seawalled. The State purchased 440 acres of land on Honeymoon Island and 653 acres on Caladesi Island.

51. Based on shoreline changes computed in appendix A, the annual recession rates at Honeymoon Island is 11.6 feet, while the annual recession rate at Caladesi Island is 16.9 feet. The selected plan will protect 4,500 feet of gulf frontage at Honeymoon Island and 3,600 feet of frontage at Caladesi Island. Based on comparable land sales on adjacent islands in Pinellas County, front land is valued at $15.00 and $12.50 per square foot for Honeymoon and Caladesi Islands respectively. Annual benefits attributed to reduction in land loss would be $783,000 for Honeymoon Island and $760,000 for Caladesi Island. These values are summarized on table D-27. To prevent duplication of benefits, the greater of recreational benefits or land loss benefits are selected for each of the segments considered in this paragraph.

TABLE D-27

LOSS OF LAND BENEFITS

Segment	Length of Protected Shore (ft)	Erosion Rate (ft/yr)	Value of Land ($/sq ft)	Annual Loss ($)
Honeymoon	4,500	11.6	15.00	$ 783,000
Caladesi	3,600	16.9	12.50	760,000
Total				$1,543,000

52. (Reserved for future use)

BENEFITS FROM PREVENTION OF DAMAGES TO DEVELOPMENT

53. Benefits from prevention of damages or losses due to shore erosion include loss of or damage to development features such as roads, buildings, and protective structures. Benefits from reduction or elimination of groin and seawall replacement and maintenance were not included in this analysis but are discussed later in this appendix. For the purpose of this analysis,

storm damage to development is defined as the damage incurred by the temporary loss of a given amount of shoreline as a direct result of wave attack caused by a storm of a given magnitude and frequency. The amount of damage to development was determined by drawing on maps and aerial photographs the expected landward recession for various storms. The structures that would be affected by a storm of a certain frequency of occurrence were identified on the aerial photograph. The amount of damage attributable to the storm was then determined utilizing site investigations and ground level photography. These damages were then coupled with the recession-frequency curve shown on figure C-2 of appendix C to develop the damage frequency curves, an example of which is shown on figure D-6. Utilizing these data the average annual damages without the considered works were computed for three alternatives summarized in table D-28 for Sand Key. Similarly, the average annual damages that would occur with the selected plan for Sand Key implemented were computed as summarized on table D-28. Based on the computations shown on this table, the average annual benefits attributable to the selected plan for Sand Key as a result of storm damage prevention would be $3,915,000 for a 20-foot berm, $4,912,300 for a 40-foot berm, $5,325,300 for a 65-foot berm, and $5,944,500 for a 100-foot berm. Similar computation were done for the remaining segments with the results displayed on table D-29.

54. Assumptions made during computation of storm damage were as follows:

a. Frequency of occurrence of shoreline recession will remain constant with time.

b. When the bluffline recedes halfway through a structure, the structure is considered a total loss.

c. If a structure was less than 1/2 undermined, the damage was assumed to be equal to the product of the market value of the structure and the ratio of the horizontal distance eroded through the structure divided by the total distance through the structure.

d. If the bluffline receded to within 10 feet of a structure, the owner of a private residence would construct a sand bag revetment and the owner of commercial property would construct a riprap revetment. (This assumption is based on present practice.)

e. It was assumed that bluffline recession would not occur for properties protected by seawalls until "recession for failure" had been reached. This is discussed further as follows:

Storm erosion causing seawall failure was related to bluffline recession using a mass balance approach. The "recession for failure" is defined as the distance that the scarp would recede landward of the seawall on an equivalent beach section not having a seawall. This wave energy which would have caused this erosion is transmitted downward at the face of the wall causing scour. When the scour reaches a certain depth, the seawall will fail due to lack of support. Assuming that the erosion volume behind the

TABLE D-28

PREVENTION OF DAMAGES TO DEVELOPMENT
(Units of $1,000)

Beach Fill Alternative	Municipality	Annual Damages Without Project	Annual Damages With Project	Attributable Benefits
20-foot berm	Ind. Rocks Beach	2675.9	1474.0	1201.9
	Ind. Shores	3121.3	1691.3	1430.0
	Red. Shores	996.5	619.6	376.9
	N. Red. Shores	920.5	438.8	481.7
	Red. Beach	592.0	167.5	424.5
	Madeira Beach	733.7	733.7	0
	Total	9039.9	5124.8	3915.0
40-foot berm	Ind. Rocks Beach	2675.9	1179.2	1496.7
	Ind. Shores	3121.3	1353.0	1768.3
	Red. Shores	996.5	495.7	500.8
	N. Red. Shores	920.5	351.8	568.7
	Red. Beach	592.0	134.0	458.0
	Madeira Beach	733.7	613.7	119.8
	Total	9039.9	4127.6	4912.3
65-foot berm	Ind. Rocks Beach	2675.9	1061.3	1614.6
	Ind. Shores	3121.3	1217.7	1903.6
	Red. Shores	996.5	446.1	550.4
	N. Red. Shores	920.5	316.6	603.9
	Red. Beach	592.0	120.6	471.6
	Madeira Beach	733.7	552.3	181.4
	Total	9039.9	3714.6	5325.3
100-foot berm	Ind. Rocks Beach	2675.9	884.4	1791.5
	Ind. Shores	3121.3	1014.8	2106.5
	Red. Shores	996.5	371.8	624.7
	N. Red. Shores	920.5	263.9	656.6
	Red. Beach	592.0	100.5	491.5
	Madeira Beach	733.7	460.0	273.7
	Total	9039.9	3095.4	5944.5

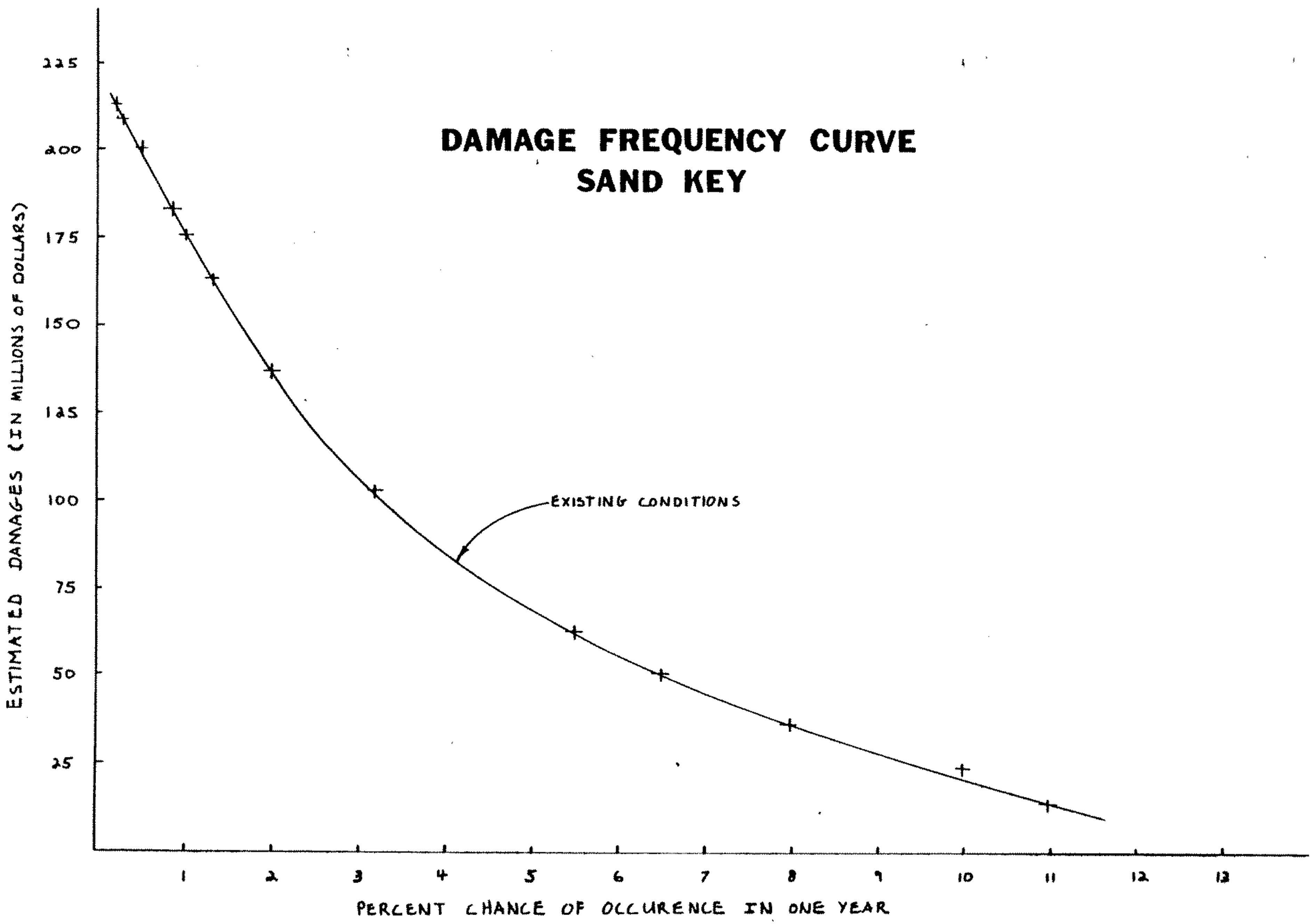

DAMAGE FREQUENCY CURVE
SAND KEY
EXISTING CONDITIONS
ESTIMATED DAMAGES (IN MILLIONS OF DOLLARS)
225
200
175
150
125
100
75
50
25
1
2
3
4
5
6
7
8
9
10
11
12
13
PERCENT CHANCE OF OCCURENCE IN ONE YEAR

TABLE D-29

PREVENTION OF DAMAGES TO DEVELOPMENT

SUMMARY

	BENEFITS IN $1,000			
Segment	20-foot berm	40-foot berm	65-foot berm	100-foot berm
Honeymoon Island	0	0	0	0
Caladesi Island	0	0	0	0
Clearwater Beach Island	298.0	588.0	629.0	676.0
Sand Key	3915.0	4912.3	5325.3	5944.5
Treasure Island	230.0	401.0	445.0	481.0
Long Key	205.0	278.0	298.0	320.0
Mullet Key	0	0	0	0

wall on the unprotected property is equal to the scour volume, the wall will fail when the "recession for failure" is 20 feet. As an example, if two equivalent properties were eroding and one of the properties contained a seawall, then recession would progress 20 feet into the unprotected property before the seawall failed on the protected property.

55. As a result of the coastal construction control line, future damages were assumed not to increase. However, it is important to note that this is a conservative assumption, since, as a result of long-term erosion, future damages to shore structures is expected to be more severe with a given storm.

BENEFITS FROM PREVENTION OF DAMAGES TO EXISTING PROTECTIVE STRUCTURES

56. Benefits from prevention of damages credited to a protective beach and subsequent nourishment are considered as equivalent to the expenditures required to maintain the existing protective structures under existing conditions and to the interest and amortization on the present worth of future replacement costs. The benefits thus obtained are discussed in the following subparagraphs for Honeymoon Island, Clearwater Beach Island, Sand Key, Treasure Island, and Long Key. There are no protective structures on Caladesi Island.

57. Honeymoon Island. There are three existing groins in the area of the selected plan for Honeymoon Island. Built in the 1960's, these groins are currently the property of the State. The total length of the groins is 1,300 feet (based on aerial surveys) and replacement would be required at years 21 and 46. Assuming replacement to be of concrete pile and timber wales, the annual cost associated with replacing and maintaining the structures is as summarized on table D-30.

58. Clearwater Beach Island. The 5,000 feet of seawalls fronting the gulf in the area selected for improvement on Clearwater Beach Island have little or no beach and are unprotected during high tide or storm activity. The walls are privately owned and constructed largely of concrete slab and piles. Table D-31 shows the annual cost of maintaining and replacing the seawalls. The frequency of replacement used in the analysis was based on design, material, construction and general condition. The protective beach would eliminate the annual cost of the seawalls yielding benefits summarized in table D-31.

59. In addition, there are 26 existing groins or 3,640 feet of groins within the area selected for improvement at Clearwater Beach Island. Seven of these groins were built by the city; the remaining 19 were built by private land owners. Annual cost of replacing and maintaining all groins are shown in table D-32. The groins are of concrete pile and timber wales. Lengths were scaled from aerial photographs.

60. Sand Key. A detailed survey of existing erosion control structures on Sand Key was completed in 1980. This survey indicated structure type, condition, length, ownership, location, and cost of maintenance and replacement. The costs were escalated to January 1984 price levels and total annual cost are summarized for Sand Key on table D-33. Table D-34 indicates the amount of public and private benefits due to prevention of damage to existing erosion control structures.

61. Treasure Island. Seawalls extend throughout the study area except for some street ends and a 500-foot reach of public beach. The walls are of various types of construction and condition. For the purpose of this analysis, it is assumed that future replacement would be of concrete slab and

pile. Total replacement and maintenance cost are shown on table D-35. Approximately 5,600 linear feet of timber and concrete pile groins were constructed by the city of Treasure Island in 1960 near the southerly end of the island. Table D-36 shows the estimated annual costs of replacing and maintaining these structures.

62. Long Key. Benefits for the island are based on replacement and maintenance costs of 1,450 feet of seawall with a rubble toe at the north end of Long Key and 2,200 feet of seawall with a sidewalk at the public beach at Pass-a-Grille. The selected protective beach at the north end will eliminate need of these protective structures. Reconstruction of the Pass-a-Grille groin will prevent erosion of the existing protective beach at the south end of the island preventing damage to the existing public seawall. Benefits are summarized on table D-37.

BENEFITS FROM ENHANCEMENT OF PROPERTY VALUES

63. The construction of the selected plan would stabilize the problem shore, thereby enabling an economically higher degree of use in the immediate area of the beach than is presently possible should erosion of the shoreline be allowed to continue. As a result of the scheduled nourishment and upon establishment of the ECL, it is estmated that some land will be brought to a higher level of use between the ECL and existing usable natural ground elevations. This area has not been determined; these enhancement benefits will be determined as the projects are implemented for each additional island segment. This process produces an increase in the value of property affected by the beach fill.

64. Honeymoon and Caladesi Islands. No land enhancement benefits are claimed for these islands as each is used for State recreational areas and an ECL is not required.

65. Clearwater Beach Island and Sand Key. No land enhancement benefits can be claimed in this report for Clearwater Beach Island until the project is implemented and the ECL established.

66. (Reserved for future use)

67. Treasure Island. Land enhancement benefits were claimed for this reach in the 1982 G&DDM Addendum III in the amount of $233,000 annually at 7 5/8 percent. It is recognized that land enhancement benefits accredited to the recommended plan for Treasure Island have occurred from implementation of the presently authorized project. These benefits are also considered to be partially duplicative of the benefits accredited to damage prevention. Accordingly, land enhancement benefits are not claimed for Treasure Island.

TABLE D-30

ESTIMATED COST OF REPLACING AND
MAINTAINING EXISTING GROINS
-HONEYMOON ISLAND-

ITEM	AMOUNT 8 1/8
Investment	
Present Worth of Replacing, 1,300-foot groins:	
Timber portion at project years 6, 16, 26, 36, and 46 (1)	$ 98,800
Concrete pile portion at project years 21 and 46 (2)	29,100
Total Present Worth	$ 127,900
Annual Cost	
Interest and Amortization	$ 10,600
Maintenance of 1,300 feet @ $4.10/l.ft.	5,300
Total Annual Cost	$ 15,900

(1) Unit cost of replacement is $168.00 per linear foot for complete groins; 40 percent ($67.20 per linear foot) is for the timber portion. Present worth of that unit cost at 6, 16, 26, 36, and 46 years hence is $76.00 at 8 1/8 percent.

(2) Cost of replacement of the concrete pile portion is 60 percent of the unit cost above, or $100.80 per linear foot. Present worth of that unit cost at 21 and 46 years hence is $22.40 at 8 1/8 percent.

TABLE D-31

ESTIMATED COST OF REPLACING AND
MAINTAINING EXISTING SEAWALLS
-CLEARWATER BEACH ISLAND-

ITEM	AMOUNT 8 1/8
Investment	
Present Worth of Replacing 5,000 feet of concrete seawalls (slab and pile) at project years 20 and 45 (1)	$ 245,000
Annual Cost	
Interest and Amortization	$ 20,300
Maintenance of 5,000 feet of concrete walls (slab and pile) at $4.10 per linear foot	20,500
Total Annual Cost	$ 40,800

(1) Unit cost of replacement is $205.00 per linear foot. Present worth of that unit cost at 20 and 45 years hence is $49.00 at 8 1/8 percent.

TABLE D-32

ESTIMATED COST OF REPLACING AND
MAINTAINING EXISTING GROINS
-CLEARWATER BEACH ISLAND-

ITEM	AMOUNT 8 1/8
Investment	
Present Worth of Replacing 3,640 feet of groins:	
Timber portion at project years 6, 16, 26, 36, and 46 (1)	$ 276,600
Concrete pile portion at project years 21 and 46	81,500
Total Present Worth (2)	$ 358,100
Annual Cost	
Interest and Amortization	$ 29,700
Maintenance of 3,640 feet @ $4.10/l.ft.	14,900
Total Annual Cost	$ 44,600

(1) Unit cost of replacement is $168.00 per linear foot for complete groins; 40 percent ($67.20 per linear foot) is for the timber portion. Present worth of that unit cost at 6, 16, 26, 36, and 46 years hence is $76.00 at 8 1/8 percent.

(2) Cost of replacement of the concrete pile portion is 60 percent of the unit cost above, or $100.80 per linear foot. Present worth of that unit cost at 21 and 46 years hence is $22.40 at 8 1/8 percent.

TABLE D-33

BENEFITS FROM ELIMINATION OF PROTECTIVE STRUCTURES 1/

Municipality	Structure Type2/	Structure Condition3/	Structure Length (ft)	Maint. Cost ($/1.ft)	Cost of Replace. ($/1.ft)	Present Worth of Replacement1/ ($1,000)	Annual Cost ($1,000)	Total Annual Cost/Municipality
						8 1/8	8 1/8	8 1/8
Indian Rocks Beach	TTPB	Good	2100	--	103	94.30	7.8	
	CC&CS	Fair	1805	--	205	116.24	9.6	
	CC&CS	Good	4000	27.6	--	28.00	2.3	
	TTPB	Poor	2050	--	103	259.33	21.5	
	TG	Poor	2260	--	187	518.90	43.0	
	CC&CS-1	Good	370	25.2	--	2.64	0.2	
	TTPB	Fair	950	--	103	86.07	7.1	
	CBB	Good	860	32.4	--	7.07	0.6	
	CC&CS-3	Fair	1415	--	205	91.13	7.6	99.7
Indian Shores	CC&CS	Good	5680	27.6	--	39.76	3.3	
	TTPB	Fair	540	--	103	48.92	4.1	
	TTPB	Poor	1620	--	103	204.93	17.0	
	CC&CS-1	Fair	370	--	216	23.83	2.0	
	CC&CS	Poor	1150	--	205	221.03	18.3	
	TG	Poor	700	--	187	160.72	13.3	
	CBB	Fair	110	--	111	3.84	0.3	
	CC&CS-3	Good	488	27.6	--	3.42	0.3	58.6
Redington Shores	TTPB	Fair	60	--	103	5.44	0.4	
	CC&CS	Good	2830	27.6	--	19.81	1.6	
	CC&CS	Fair	580	--	205	37.35	3.1	
	CC&CS	Poor	880	--	205	169.14	14.0	
	CBB	Fair	186	--	111	6.49	0.5	
	CC&CS-3	Good	630	27.6	--	4.41	0.4	20.0
North Redington Beach	CC&CS	Good	3000	27.6	--	21.00	1.7	
	CBB	Fair	860	--	111	30.01	2.5	
	CC&CS-3	Good	150	27.6	--	1.05	0.1	4.3
Redington Beach	CC&CS	Fair	1030	--	205	66.33	5.5	
	CC&CS	Good	4060	27.6	--	28.42	2.4	
	CC&CS-3	Fair	270	--	205	17.39	1.4	9.3

TABLE D-33 (Cont)

BENEFITS FROM ELIMINATION OF PROTECTIVE STRUCTURES 3/

Municipality	Structure Type2/	Structure Condition3/	Structure Length (ft)	Maint. Cost ($/l.ft)	Cost of Replace. ($/l.ft)	Present Worth of Replacement1/ ($1,000)	Annual Cost ($1,000)	Total Annual Cost/Municipality
						8 1/8	8 1/8	8 1/8
Madeira Beach	KPG-3	Poor	5850	--	133	955.31	79.2	
	CC&CS	Good	4930	27.6	--	34.51	2.9	
	CBB	Fair	820	--	111	28.62	2.4	
	CC&CS	Fair	1160	--	205	74.705	6.2	90.7
Total Sand Key								282.6

1/ All prices updated to Jan 1984 price levels

2/ Type based on:
KPG - King Pile Groin
CBB - Concrete Block Bulkhead
TTPB - Treated Timber Pile
TG - Timber Groin
CC&CS - Concrete Cap, Concrete Sheet-Pile
1 = with integral sidewalk
2 = with integral sidewalk & toe protection
3 = public structures

3/ Replacement based on condition as follows:
Good timber at 15, 30, and 45
Fair timber at 6, 21, and 36
Poor timber at 2, 17, 32, and 47
Good concrete - maintain at years 20 and 40
Fair concrete at 16 and 46
Poor concrete at 2 and 32

TABLE D-34

SUMMARY OF BENEFITS FROM PREVENTION OF DAMAGES
TO EXISTING PROTECTIVE STRUCTURES
-SAND KEY-
($1,000)

Beach Fill Alternative	Municipality	Public 8 1/8%	Private 8 1/8%	Total 8 1/8%
40-foot berm	Indian Rocks	7.6	92.1	99.7
	Indian Shores	0.3	58.3	58.6
	Red. Shores	0.4	19.6	20.0
	N. Red. Beach	0.1	4.2	4.3
	Red. Beach	1.4	7.9	9.3
	Madeira Beach	79.2	11.5	90.7
		89.0	193.6	282.6

TABLE D-35

ESTIMATED COST OF REPLACING AND
MAINTAINING EXISTING SEAWALLS
-TREASURE ISLAND-

ITEM	AMOUNT 8 1/8%
Investment	
Present Worth of Replacing 8,160 feet of concrete seawalls (slab and pile) at project years 5 and 30 (1)	$1,792,500
Annual Cost	
Interest and Amortization	$ 107,200
Maintenance of 9,200 feet of concrete walls (slab and pile) at $4.10 per linear foot	37,700
Total Annual Cost	$ 144,900

(1) Unit cost of replacement is $205.00 per linear foot. Present worth of that unit cost 5 and 30 years hence is $158.40 at 8 1/8 percent.

TABLE D-36

ESTIMATED COST OF REPLACING AND
MAINTAINING EXISTING GROINS
-TREASURE ISLAND-

ITEM	AMOUNT 8 1/8%
Investment	
Present Worth of Replacing 5,600 linear feet of wood-concrete pile groins:	
Wood portion at project years 6, 16, 26, 36, and 46 (1)	$ 425,600
Concrete pile portion at project years 21 and 46 (2)	125,400
Total Present Worth	$ 551,000
Annual Cost	
Interest and Amortization	$ 45,700
Maintenance of 5,600 (approx.) linear feet of groins @ $4.10/l.ft.	23,000
Total Annual Cost	$ 68,700

(1) Unit cost of replacement is $168.00 per linear foot for complete groin; 40 percent or ($67.20 per linear foot) is for timber portion. Present worth of that unit cost at 6, 16, 26, 36, and 46 years hence is $76.00 at 8 1/8 percent.

(2) Unit cost of replacement is $168.00 per linear foot for complete groin; 60 percent is for the concrete pile portion, or $100.80 a linear foot. Present worth of that unit cost at 21 and 46 years hence is $22.40 at 8 1/8 percent.

TABLE D-37

BENEFITS DERIVED FROM PROTECTION
OF EXISTING STRUCTURES
-LONG KEY-

ITEM	AMOUNT 8 1/8%
Investment	
Present Worth of Replacing 1,450 feet of concrete seawalls and rubble toe at project years 10 & 35 (1)	$ 191,400
Present Worth of Replacing 2,200 feet of concrete seawall with sidewalk at project years 10 and 35 (2)	248,600
Total Present Worth	$ 440,000
Annual Cost	
Interest and Amortization	$ 36,500
Maintenance of 3,650 feet of concrete seawall at $4.10 per linear foot	15,000
Total Annual Cost	$ 51,500

(1) Unit cost of replacing northern seawall is $252.00 per linear foot. Present worth of that unit cost at 10 & 35, years hence is $132.00 at 8 1/8 percent.

(2) Unit cost of replacing southern public seawall is $216.00 per linear foot. Present worth of that unit cost at 10 and 35 years hence is $113.00 at 8 1/8 percent.

68. Long Key. Land enhancement benefits are not claimed for Long Key. The southern 5,500 feet of the island is a publicly-owned beach which is developed to the highest degree allowable. The development on the northern end of the island consists of two high-rise condominiums and a public beach park. This area has been developed to the highest degree possible in keeping with local zoning, coastal zone management, and recreation planning and no land enhancement benefits are claimed.

69. Mullet Key. No land enhancement benefits are claimed for Mullet Key as it is developed to the highest potential as a public park.

SUMMARY OF BENEFITS

70. Table D-38 presents a summary of the average annual benefits provided by implementation of the beach fill alternative. Project benefits would result from recreation, prevention of land loss, prevention of damages to development and prevention of damages to erosion control structures. Benefits are based on January 1984 price levels and an interest rate of 8 1/8 percent.

COST ANALYSIS

FIRST COST

71. The estimated first cost of the beach fill alternative, based on January 1984 price levels, are shown in table D-39. Costs of the beach fill for various berm widths are based on the use of borrow areas in the Gulf of Mexico and adjacent passes as specified by each estimate. Location of the borrow areas are found in figure C-2 of appendix C. The cost of lands, easements, and rights-of-way, which are the responsibility of local interests, are considered nominal in this case and have not been included in the cost estimates. There are no charges for interest during construction since the construction period is short and benefits would accrue as construction progresses. The initial cost are based upon the conditions described in the following paragraphs.

72. Honeymoon Island. The beach fill plan provides for placement of 80,000, 100,000, 169,000, and 256,000 cubic yards of fill for protection for 20-foot, 40-foot, 65-foot, and 100-foot berms, respectively. These amounts include sorting losses and 2 years of advanced nourishment along a 4,500-foot-long reach of gulf shoreline. The material is to be obtained from shoals offshore of Hurricane Pass. Periodic nourishment, 15,000 cubic yards annually, will be obtained from Hurricane Pass offshore shoal areas.

72. Caladesi Island. No initial nourishment required. Periodic nourishment of 10,000 cubic yards annually will be obtained from Hurricane Pass offshore shoal areas.

73. Clearwater Beach Island. The beach fill plan for Clearwater Beach provides 20-foot, 40-foot, 65-foot, and 100-foot berm protection with quantities of 80,000, 100,000, 172,000, and 265,000 cubic yards, respectively. The quantities include sorting losses and 2 years of advanced nourishment along a 5,000-foot-long reach of gulf shoreline. The initial fill and periodic nourishment of 10,000 cubic yards annually will be obtained from Clearwater Pass offshore shoal areas.

TABLE D-38
SUMMARY OF ANNUAL BENEFITS
(Units of $1,000)

Segment	Berm Width (ft)	Recreation 8 1/8%	Land Loss 8 1/8%	Damage to Development 8 1/8%	Damage to ECS 8 1/8%	Total (Rounded) 8 1/8%
Honeymoon[1/] Island	20	0	783	0	15.9	799
	40	0	783	0	15.9	799
	65	0	783	0	15.9	799
	100	0	783	0	15.9	799
Caladesi Island	20	0	760	0	0	760
	40	0	760	0	0	760
	65	0	760	0	0	760
	100	0	760	0	0	760
Clearwater Beach Island	20	578	0	298	85.4	961
	40	578	0	588	85.4	1251
	65	578	0	629	85.4	1292
	100	578	0	676	85.4	1339
Sand Key	20	4481	0	3915.0	282.6	8679
	40	4481	0	4912.3	282.6	9676
	65	4481	0	5325.3	282.6	10089
	100	4481	0	5944.5	282.6	10709
Treasure Island	20	0	0	230	213.6	444
	40	0	0	401	213.6	615
	65	0	0	445	213.6	659
	100	0	0	481	213.6	695
Long Key	20	154	0	205	51.5	411
	40	154	0	278	51.5	484
	65	154	0	298	51.5	504
	100	154	0	320	51.5	526
Mullet Key	20	891	0	0	0	891
	40	891	0	0	0	891
	65	891	0	0	0	891
	100	891	0	0	0	891
Total Project	20	6104	1543	4648	649	12944
	40	6104	1543	6179	649	14475
	65	6104	1543	6697	649	14993
	100	6104	1543	7422	649	15718

1/ No recreation benefits are claimed for Honeymoon and Caladesi Islands in order to prevent duplication of benefits in the land loss category.

TABLE D-39
INITIAL COST OF BEACH FILL

Segment	Berm Width (feet)	Initial Volume (1,000 c.y.)	COST IN $1,000 Fill Material	Mob/ Demob	Monitor	Contingencies 15%	S&A & E&D (15%)	Initial Cost
Honeymoon Island	20	80	170	440	10	93	107	820
	40	100	213 1/	440	10	99	114	876
	65	169	395	440	10	127	146	1118
	100	256	625	440	10	161	185	1421
Caladesi 1/ Island				(110)6/	(10)6/			0
Clearwater Beach Island	20	80	273	440	10	108	125	956
	40	100	341 2/	440	10	119	137	1047
	65	172	772	440	10	183	211	1616
	100	265	1327	440	10	267	307	2351
Sand Key	20	2206	14,123	1440	30	2339	2690	20,622
	40	2670	17,400 3/	1440	30	2830	3255	24,955
	65	3250	21,420	1440	30	3434	3950	30,274
	100	4180	27,920	1440	30	4410	5070	38,870
Treasure 4/ Island	40			(385)6/	(10)6/			0
Long Key	40	150	401 4/	220	5	94	108	828
Mullet Key 5/	60	150		(385)6/	(10)6/			0

1/ Unit cost of fill is $2.13/c.y. for 100,000 c.y. from Hurricane Pass and $2.64/c.y. for fill over the initial 100,000 c.y. to be obtained from Hurricane Pass shoals.
2/ Unit cost of fill is $3.41/c.y. for 100,000 c.y. from Clearwater Beach island and $5.98/c.y. for fill over the initial 100,000 c.y. to be obtained from Hurricane Pass shoals.
3/ Unit cost of fill is $4.52/c.y. for 525,000 c.y. from Johns Pass and $6.99/c.y. for fill over the 525,000 c.y. to be obtained from Egmont Channel shoals (offshore borrow area #1).
4/ Unit cost of fill is $2.67/c.y. for 150,000 c.y. from Blind Pass and $7.02/c.y. for fill over the initial amount obtained from Egmont Channel shoals.
5/ Unit cost of fill is $4.00 from Egmont Channel shoals to Mullet Key.
6/ Displayed for information only, as no initial fill is required for these reaches. These Mob/Demob and monitoring costs were used in determining nourishment costs.

74. Sand Key. The beach fill plan for Sand Key provides 20-foot, 40-foot, 65-foot, and 100-foot berm protection with quantities of 2,206,000, 2,670,000, 3,250,000, and 4,180,000 cubic yards of fill, respectively. The quantities include sorting loss and 5 years of advanced nourishment along 41,700 feet of gulf front. The material would be obtained from bars adjacent to Johns Pass (525,000 c.y.) and from offshore borrow area #1. Annual nourishment requirements of 56,000 cubic yards would be obtained from the Johns Pass bar.

75. Treasure Island. No initial nourishment is required for Treasure Island. Periodic nourishment requirements of 50,000 cubic yards per year will be obtained from the offshore borrow area #1.

76. Long Key. Initial fill consisting of 3 years' advance nourishment for a 40-foot berm protection will require 150,000 cubic yards of fill. This quantity includes sorting losses and advanced nourishment. Fill will be obtained from bars adjacent to Blind Pass. Periodic nourishment requirement of 50,000 cubic yards per year will be obtained from the same area.

77. Mullet Key. No initial nourishment is required for Mullet Key. Periodic nourishment requirements of 30,000 cubic yards per year will be obtained from the offshore borrow area #1.

ANNUAL COST

77. Estimates of annual cost are based on an economic life of 50 years for each segment. Interest and amortization charges were computed at 8 1/8 percent. The annual cost of operation and maintenance, including periodic nourishment is also included. Material for periodic nourishment will be obtained from the bars associated with the adjacent island passes as noted in the previous paragraphs. A summary of the annual costs for the selected plan is found in table D-40. Table D-41 summarizes the annual costs and benefits associated with implementing the selected plan for each island segment.

TABLE D-40
ANNUAL COST SUMMARY
BEACH FILL (SELECTED PLAN)*
(8 1/8%)

Segment	Berm Width (ft)	Initial Cost ($1000's)	Renourishment Volume 1/ (1000's cy)	Renourishment Cost 2/ ($1000's)	Renourishment Borrow Area Location	Nourishment Start Date (Project Yr)	Average Annual Cost ($1000's) I&A 3/	Average Annual Cost ($1000's) Nourishment	Average Annual Cost ($1000's) Total
Honeymoon Island	20*	820	75	806	Hurricane Pass 4/	3	68	160	228
	40	876					73		233
	65	1118					93		253
	100	1421					118		278
Caladesi Island	--*	0	50	300	Hurricane Pass 4/	5	0	51	51
Clearwater Beach Island	20	956	50	821	Clearwater Pass 4/	3	79	163	242
	40*	1047					87		250
	65	1616					134		297
	100	2351					195		358
Sand Key	20	20622	280	3618	Johns Pass 4/	5	1710	615	2325
	40*	24955					2069		2684
	65	30274					2510		3125
	100	38870					3223		3838
Treasure Island	40*5/	0	250	1980	Offshore Borrow Area #1	5	0	337	337
Long Key	40*5/	828	250	1756	Blind Pass 4/	4	69	323	392
Mullet Key	60*5/	0	150	1316	Offshore Borrow Area #1	5	0	224	224

1/ Nourishment volume for 5-year intervals
2/ Includes mob/demob, unit price yer yard, monitoring cost contingencies and E&D, S&A
3/ Interest and amortization of first cost
4/ Borrow areas are located on bars adjacent to the indicated pass
5/ Nourishment of authorized project dimensions
* Selected Plan (NED Plan)

TABLE D-41

SUMMARY OF ANNUAL BENEFITS AND COST
BEACH FILL (SELECTED PLAN)*

Segment	Berm Width (ft.)	Annual Charges in $1,000's Benefits 8 1/8%	Cost 8 1/8%	B/C 8 1/8%	Net Benefits 8 1/8%
Honeymoon Island	20	799	228	3.5	571*
	40	799	233	3.4	566
	65	799	253	3.2	546
	100	799	278	2.9	521
Caladesi Island 1/	-	760	51	14.9	709*
Clearwater Beach Island	20	961	242	4.0	719
	40	1251	250	5.0	1001*
	65	1292	297	4.4	995
	100	1339	358	3.7	981
Sand Key	20	8679	2325	3.7	6354
	40	9676	2684	3.6	6992*
	65	10089	3125	3.2	6964
	100	10709	3838	2.8	6871
Treasure Island 1/	40	615	337	1.8	278*
Long Key 1/	40	484	392	1.2	92*
Mullet Key 1/	60	891	224	4.0	667*

* NED Plan

1/ Provides for periodic nourishment only

APPENDIX E

PERTINENT CORRESPONDENCE

Correspondence from Local Sponsor

APPENDIX E

PERTINENT CORRESPONDENCE

TABLE OF CONTENTS

BOARD OF COUNTY COMMISSIONERS

PINELLAS COUNTY, FLORIDA
315 COURT STREET
CLEARWATER, FLORIDA 33516

June 11, 1984

Mr. A. J. Salem, Chief
Planning Division
Jacksonville District, Corps of Engineers
PO Box 4970
Jacksonville, FL 32232

Dear Mr. Salem:

I have reviewed the Draft Beach Erosion Control Project Review Study and Environmental Impact Statement for Pinellas County, Florida, May, 1984, by the Corps of Engineers, Jacksonville District. The Study is a thorough engineering, scientific, recreational, and jurisdictional analysis of Pinellas County's beaches.

We agree that the extensive renourishment recommended by the Corps would greatly benefit the County. However, as indicated in the specific attached comments, we find that dune restoration has more positive benefits than appear to be addressed in the Study report.

We appreciate having the opportunity to review and comment on this Study. Please let me know if I can provide any information.

Sincerely,

Brian K. Smith,
Director, Planning Department

BKS/JL:cw

cc: Sandra Eberhard, Tampa Bay Regional Planning Council

PINELLAS COUNTY PLANNING DEPARTMENT
COMMENTS ON THE
DRAFT BEACH EROSION CONTROL PROJECT
REVIEW STUDY AND ENVIRONMENTAL
IMPACT STATEMENT FOR
PINELLAS COUNTY, FLORIDA
MAY, 1984

The Planning Department has reviewed the above referenced project. In general, the EIS draft program proposed would enhance the achievement of this agency's objectives for planning. In our opinion, the following comments identify concerns deserving increased attention in the study:

Reference Page and Paragraph Number	Comments
Page 50-51 Alternative S-7 and Alternative S-9	More scientific and economic analysis should be devoted to the vegetated dune creation alternatives. The implementation of "beach fill with periodic nourishment and hurricane surge protection sand dune" would create a more natural and beautiful beach profile. Additionally, the reserve supply of sand stored in the created dune would negate some future renourishment needs and costs. Storm damage benefits would also increase from dune creation. The beauty of natural beach plants such as sea oats is well-recognized. They are definitely not "unsightly." In addition, sea oats help maintain sand on beaches, not "deprive the area of sand beach."
Page 58 Paragraph No. 153	The location of Hurricane Pass Shoals should be identified.
Page A-17 Paragraph No. 55	Pinellas County's adopted conservation and coastal zone management policies encourage restoration of natural beach and dune vegetation. One such policy has been quoted here by the Corps of Engineers. It should be noted in conjuction with the comments above.

Pinellas County
Dept. of Environmental Mgmt. , having completed
(Agency)

its review of IC&R # 109-84 concurs

with the project and has no additional comments.

for JACOB F. STOWERS, III
Name

Director
Position

6/22/84
Date

E-3

BOARD OF COUNTY COMMISSIONERS
PINELLAS COUNTY, FLORIDA

DEPARTMENT OF PUBLIC WORKS AND UTILITIES
ENGINEERING - OPERATIONS - SOLID WASTE - WATER - SEWER
315 COURT STREET
CLEARWATER, FLORIDA 33516
Phone: (813) 462-3251

June 22, 1984

Mr. Andrew Hobbs
Coastal Section
U.S. Army Corps of Engineers
P. O. Box 4970
Jacksonville, Florida 32201

Re: Beach Erosion Control Project Review Study and Environmental Impact Statement for Pinellas County, Florida

Dear Andy:

Please find enclosed a certified copy of a resolution adopted by the Pinellas County Board of County Commissioners supporting the referenced Review Study.

Sincerely,

James B. Terry
Engineering Services

JBT:bh

Attachment

NO. 84-211

A RESOLUTION BY THE PINELLAS COUNTY BOARD OF COUNTY COMMISSIONERS REQUESTING THE CHIEF OF ENGINEERS, U.S. ARMY CORPS OF ENGINEERS, ADOPT THE "BEACH EROSION CONTROL PROJECT REVIEW STUDY AND ENVIRONMENTAL IMPACT STATEMENT FOR PINELLAS COUNTY, FLORIDA" PROVIDING FOR THE BOARD OF COUNTY COMMISSIONERS TO ACT AS LOCAL SPONSOR FOR CORPS OF ENGINEERS PROJECTS WITHIN PINELLAS COUNTY

WHEREAS, Pinellas recognizes the continued threat of beach erosion to the safety and welfare to the citizens of Pinellas County; and

WHEREAS, a large beach profile with suitable structural improvements will provide to the citizens of Pinellas County and Seasonal Visitors, a recreational facility unsurpassed in the State of Florida; and

WHEREAS, the Federal Government of the United States, working through the U. S. Army Corps of Engineers, recognizes its obligation to provide financial assistance to its citizens, residing in Pinellas County.

NOW THEREFORE BE IT RESOLVED by the Board of County Commissioners of Pinellas County Florida in open session this 19th day of June, 1984 that the Chief of Engineers, U. S. Army Corps of Engineers, be requested to adopt the "Beach Erosion Control Project Review Study and Environmental Impact Statement for Pinellas County, Florida" prepared by the Jacksonville District, U. S. Army Corps of Engineers. Be it further resolved that the Pinellas County Board of County Commissioners will continue to act as local sponsor for Federal Beach Erosion Control Projects on the barrier islands of Pinellas County, Florida. Commissioner Cazares offered the foregoing Resolution and moved its adoption, which was seconded by Commissioner Todd and upon roll call the vote was:

I, KARLEEN F. De BLAKER, Clerk of the Circuit Court and Clerk Ex-Officio, Board of County Commissioners, do hereby certify that the above and foregoing is a true and correct copy of the original as it appears in the official files of the Board of County Commissioners of Pinellas County, Florida.
Witness my hand and seal of said County,
this 20th day of June A.D. 1984
KARLEEN F. De BLAKER, Clerk of the Circuit Court Ex-Officio Clerk to the Board of County Commissioners, Pinellas County, Florida.
By: G. K. West
Deputy Clerk

Correspondence from Other Local Sources

tampa bay regional planning council

9455 Koger Boulevard
St. Petersburg, FL 33702
(813) 577-5151 Tampa 224-9380

July 16, 1984

Mr. A.J. Salem
Chief, Planning Division
Department of the Army
Jacksonville District
Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232

Dear Mr. Salem:

Subject: IC&R #109-84; Pinellas County Beach Erosion Control Study Draft Environmental Impact Statement

The enclosed agenda item regarding the above referenced matter was considered and approved by the Clearinghouse Review Committee of the Tampa Bay Regional Planning Council at its June 25, 1984 Clearinghouse Review Committee meeting.

Please contact the Council staff if further information regarding this item is desired.

Sincerely,

Sandra Eberhard

Sandra Eberhard
Clearinghouse Review Committee

SE/lk

Enclosure

cc: Walt Kolb

IC&R #109-84; Pinellas County Beach Erosion Control Study Draft Environmental Impact Statement

CLEARINGHOUSE REVIEW

The Army Corps of Engineers has requested review and comment on the Draft Beach Erosion Control Project Review Study and Environmental Impact Study (EIS) for Pinellas County, Florida. The purpose of the report is to reexamine the problem of beach erosion along the Pinellas County gulf shore, develop the most suitable plan for restoration and protection of problem areas and review the 1966 authorized project to determine the advisability of extending Federal participation in periodic nourishment cost. Location: Pinellas County; Agency: COE.

Local Comments Requested From:

Pinellas County Planning Department: See attached letter dated June 11, 1984

Pinellas County Department of Public Works: Concurrence transmitted June 1, 1984

Pinellas County Environmental Management: No comments received as of June 22, 1984

City of St. Petersburg: No comments received as of June 22, 1984

City of Madeira Beach: Concurrence transmitted June 1, 1984

Council Comments and Recommendations:

This project has been reviewed for consistency with the Council's adopted growth policy, the Future of the Region. The proposal has been found to be consistent with Council policy that in areas where beaches are being eroded, a multi-jurisdictional approach to stabilization projects, preferably utilizing vegetation as the stabilizing medium, be encouraged; that programs guaranteeing public access to the beaches be encouraged and that no new construction be permitted that would threaten the beach. It is also Council policy to encourage sound coastal management to ensure that maximum long-term benefits are attained in the use of the coastal zone. Council policy presently encourages the adoption of the majority of the non-structural alternatives presented in the EIS, however, economic forces dictate that some structural alternative will have to be implemented.

The plans selected in the report provide for:

- Initial nourishment of 4,500 feet of Honeymoon Island with periodic nourishment through project life;
- Periodic nourishment of Caldesi Island in conjunction with nourishment of Honeymoon Island.

- Initial nourishment of 5,000 feet of shore at Clearwater Beach Island with periodic nourishment through project life;

- Initial nourishment of 38,500 feet of shore at Sand Key with periodic nourishment through project life; and

- Continued nourishment of Treasure Island, Long Key (will include breakwater) and Mullet Key through project life.

In general, beach nourishment measures result in temporary and minimal environmental impacts. The selected plan apparently calls for a combination of structural plans involving initial and periodic sand nourishment, as well as the construction of offshore breakwaters to minimize wave energy. The construction of hurricane berms (plan 7) in selected areas where protection from storm surge is minimal (i.e. Indian Rocks Beach) followed by a comprehensive dune re-vegetation program (plan 9) would go a long way in providing ocean front structures additional protection from wave runup and subsequent dune erosion. Dunes vegetated with sea-oats are aesthetically pleasing and provide a degree of rare wildlife habitat. In addition, dune creation and re-vegetation is explicitly cited as an adopted regional growth policy (2.701 (f.2)) in regard to Gulf beaches. It is therefore suggested that components of structural plans 7 and 9 be incorporated into the selected overall plan.

Although impacts would be minimal with the selected plan the following additional stipulations should be adhered to:

- In locating a suitable offshore borrow area, productive hard-bottom communities should be avoided;

- The offshore borrow area should contain sediments of large groin size and low percentage organics in order to avoid excessive water quality problems associated with re-suspension.

- Dredging of the borrow area should be no deeper than surrounding contours in order to avoid anoxia and other water quality problems associated with dredge pits;

- Beach fill areas should be diked in areas where the accidental infilling of landward lagoons is possible;

- Beach nourishment activities should be concentrated during the months of October - March to avoid disturbing the nesting habitats of sea-turtles; and

- All affected groins and jetties should first be re-stabilized since beach nourishment often results in the closing or migration of barrier island passes.

The draft EIS does not clearly identify the historical success rate of offshore breakwaters in reducing sand erosion for the selected plan with regards to the number and location of offshore breakwaters. For example, on page 51 no breakwaters are identified; on pages 65-66 breakwaters are described for Sand Key, Redington Shores and Long Key; on page 71 it is stated that breakwaters will be built on both Long and Sand Keys; on page

83 it is stated that there will be a breakwater for only Redington Shores; and on page EIS-11 that there will only be one for Long Key. Clarification of successful results from existing breakwaters relevant to the proposed areas should be addressed in this study. In any case, no offshore breakwaters should be built below MSL, as this would pose a significant navigational hazard. All breakwaters should be well marked and clearly visible at high tide.

Upon inclusion of the above stipulations, it is recommended that this proposal be approved for funding. Further, it is recommended that any additional comments addressing local concerns be considered prior to approval.

Committee adopted June 25, 1984.

Joe McFarland, Chairman
Clearinghouse Review Committee

Please note: Unless otherwise notified, action by the Clearinghouse Review Committee is final. Please append a copy to your application to indicate compliance with clearinghouse requirements. The committee's comments constitute compliance with Florida's Intergovernmental Coordination and Review process only.

SAJPD-C 27 January 1983

Mr. Thomas W. Reese
123 Eighth Street North
St. Petersburg, Florida 33701

Dear Mr. Reese:

In response to your recent letter, the Jacksonville District has responded to each comment as thoroughly as possible. Please find a copy of the response inclosed. As noted, the draft report and EIS should consider each of the comments raised in your letter in accordance with standard Corps of Engineers planning procedures.

As you requested, your name has been added to the mailing list for the Pinellas County area. You should receive the draft report and EIS during our first mailing.

Should you require further information please do not hesitate to contact either me or my staff.

Sincerely,

A. J. SALEH
Chief, Planning Division

Incl
As stated

COMMENTS AND RESPONSES
to Thomas W. Reese Letter of 17 Dec 82
Pinellas County Beach Restoration EIS

Comment 1: A no action alternative since past restoration efforts have been futile.

Response 1: A no action alternative will be included in the report and EIS. As part of the planning process and in accordance with the Water Resources Council "Principals and Standards for Water and Related Land Resources Planning - Level C," an analysis must be made of the without plan condition for U. S. Army Corps of Engineers projects such as the Pinellas County BEC project. The analysis considers existing and forecasted conditions without any of the alternative plans considered, and results are included in the report and EIS as a "no-action" alternative. Please note that aerial photographs of Long Key and Treasure Island, post project, show the nourishment is remaining in place over the principal area indicating past efforts have not been futile.

Comment 2: A complete and thorough study of erosion trends over the past twenty-five years.

Response 2: Comparative positions of the shoreline, offshore depth surveys, and volumetric changes over the period of record are being computed and will be presented in the draft report. The basis for comparison are surveys made by the U. S. Coast and Geodetic Survey in 1873, 1926, and 1939; by the Florida Department of Natural Resources in 1975 and 1977; and by the Corps of Engineers in 1950 and 1979.

Comment 3: A complete and thorough study of offshore ground contours and how past dredging activities for beach restoration have affected the Gulf bottom (i.e. effects of deep dredge holes).

Response 3: Several studies have been completed concerning offshore dredging in connection with beach nourishment. A reference list follows. The Corps of Engineers keeps abreast of the studies to evaluate effects of dredging activities on surrounding bottoms. An analysis of the known effects of dredging activities is included in the report and EIS when such activities are part of a selected alternative plan.

Comment 4: Predicted historical storm tides and predicted maximum wave uprush.

Response 4: Engineering design of a beach, like other protective coastal structures, is based on "state of the art" procedures. Sound engineering design considers historical patterns for each geographic area considered. Additionally, all natural forces and their effects which influence the shoreline, including wave uprush, are considered in the design of a protective beach.

Comments and Responses to Thomas W. Reese Letter of 17 Dec 82
(cont'd)

Comment 5: Effect of dredging on Gulf bottom biological activity.

Response 5: Several of the references listed in response no. 3 relate to dredging effects on biological activity in the gulf. In accordance with the Fish and Wildlife Coordination Act of 1958, the Corps of Engineers coordinates its activities, including dredging for beach nourishment, with the U. S. Fish and Wildlife Service, the National Marine Fisheries Service, and the Environmental Protection Agency. Each of these agencies offers expert advice on the effects of Corps actions on biological activity at dredge sites.

Comment 6: Sources of sand other than dredging to renourish beach (i.e. move sand on north end of Treasure Island - truck in sand from upland site).

Response 6: In the formulation of alternative plans, which include alternative sand sources, an effort is made to include only the alternatives which provide combined beneficial National Economic Development (NED) and Environmental Quality (EQ) effects outweighing combined adverse NED and EQ effects or, that achieve specified beneficial effects for human life without unreasonably reducing net beneficial effects to the NED and EQ objectives. Generally, the Jacksonville District accomplishes this by combining the maintenance of navigation channels with beach nourishment projects. When additional sources of sand are required, the Corps must evaluate the source on the basis of both NED and EQ in accordance with the established guidelines. Upland sources of sand are generally eliminated during this procedure due to cost limitations.

REFERENCE LIST:

MARSH, G.A., "Offshore Dredging and Benthic Ecology," Florida Environmental and Urban Issues, Vol. VII, No. 2, 1980, pp. 1-5.

MARSH, G.A., et al., "Environmental Assessment of a Nearshore Borrow Area in Broward County, Florida," Final Report, Joint FAU-FIU Center for Environmental and Urban Problems, Fort Lauderdale, Fla., 1978.

MARSH, G.A., et al., "Evaluation of Benthic Communities Adjacent to a Restored Beach, Hallandale (Broward County), Florida," Vol. II, Ecological Evaluation of a Beach Nourishment Project at Hallandale (Broward County), Florida, MR 80-1, U. S. Army Corps of Engineers, Coastal Engineering Research Center, Fort Belvoir, Va., Mar. 1980.

SALOMAN, C.H., "Physical, Chemical, and Biological Characteristics of the Nearshore Zone of Sand Key, Florida, Prior to Beach Restoration," Vols. 1 and 2, National Marine Fisheries Service, Gulf Coast Fisheries Center, Panama City, Fla., 1974.

SALOMAN, C.H., NAUGHTON, S.P., and TAYLOR, J.L., "Short-Term Effects of Beach Nourishment on Benthic Fauna of Borrow Pits and Adjacent Sediment, Panama City Beach, Florida," U. S. Army Corps of Engineers, Coastal Engineering Research Center, Fort Belvoir, Va. (in preparation, 1982).

THOMAS W. REESE
ATTORNEY AT LAW
193 EIGHTH STREET NORTH
ST. PETERSBURG, FLORIDA 33701

(813) 822-4084

December 17, 1982

A. J. Salem
Acting Chief - Planning Division
Corps. of Engineers
P. O. Box 4970
Jacksonville, Florida 32232

RE: Pinellas County Beach Restoration EIS

Dear Mr. Salem:

As legal counsel for Booker Creek Preservation, Inc., I would like to suggest the following issues to be considered:

1. A no action alternative since past restoration efforts have been futile;

2. A complete and thorough study of erosion trends over the past twenty-five years;

3. A complete and thorough study of offshore ground contours and how past dredging activities for beach restoration have affected the Gulf bottom (i.e. effects of deep dredge holes);

4. Predicted historical storm tides and predicted maximum wave uprush;

5. Effect of dredging on Gulf bottom biological activity; and

6. Sources of sand other than dredging to renourish beach (i.e. move sand on north end of Treasure Island - truck in sand from upland site).

Lastly, could you please send me copies of all future reports and notices about this project.

Very truly yours,

Thomas W Reese

Thomas W. Reese

TWR/jmt

Correspondence from State Agencies

STATE OF FLORIDA
Office of the Governor
THE CAPITOL
TALLAHASSEE 32301

BOB GRAHAM
GOVERNOR

July 6, 1984

Mr. A. J. Salem
Chief, Planning Division
Department of the Army
Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232

Dear Mr. Salem:

In response to your request we have coordinated a review of your draft Beach Erosion Control Project Review Study and Environmental Impact Statement for Pinellas County. Copies of your document were distributed to interested state agencies. Attached for your consideration are letters of comment from the Departments of Agriculture and Consumer Services, Commerce, Community Affairs, Environmental Regulation, Natural Resources, State,and Game and Fresh Water Fish Commission. Any additional agency comments received by this Office will be forwarded to you immediately.

The purpose of the report is to examine the beach erosion problems along Pinellas County's Gulf shore and develop a suitable action plan to ameliorate the erosion problem. The report tentatively selects several plans that will nourish 4500 feet of Honeymoon Island, 5000 feet of the Clearwater Beach Island, 38,500 feet of Sand Key, Caladesi Island periodically and renourish Treasure Island, Long Key and Mullet Key. The estimated cost for these nourishment projects is $4,117,200. The benefit: cost ratio is 3.3.

Based on our review of the document and the attached agency responses, we believe that a project as suggested and appropriately modified go forward. The concerns expressed by the Department of Environmental Regulation and Natural Resources must be responded to since these agencies have permitting jurisdiction. The comments from the Departments of Commerce, Community Affairs and State as part of your overall reanalysis of the draft reports should be considered. The DER and DNR note that this draft report is consistent with the federally approved Florida Coastal Management Program. For this proposal to remain consistent with these Departments' statutory authorities, the final document must furnish the detailed information requested and adequately address their concerns.

We appreciate the opportunity to review this draft document and look forward to your response in the Final Reports for these projects.

Sincerely,

Walter O. Kolb
Sr. Governmental Analyst

WOK/jkc

cc: Dale Adams
Deborah Flack
Nancy Linnan
Douglas Bailey
George Percy
Heather Nixson
Tom Swihart
George Reinert
Leonard Elzie
Betty Rosser
Deborah Walker

STATE OF FLORIDA
DEPARTMENT OF COMMUNITY AFFAIRS

BOB GRAHAM
Governor

JOHN M. De GROVE
Secretary

M E M O R A N D U M

TO : Ron Fahs, Director
Intergovernmental Coordination

FROM: Nancy Linnan, Assistant Secretary

SUBJ: FL8405161223EC - Draft Environmental Impact Statement Beach Erosion Control Project Review Study for Pinellas County, Florida

DATE: June 20, 1984

We have no specific objections to this proposal, but would like to make some general comments on beach erosion and renourishment activities. Beach erosion is a natural phenomenon which can be arrested only at great cost; renourishment slows the process or transfers it elsewhere, but cannot neutralize it.

A truly effective program to deal with the beach erosion problem would include non-structural steps to reduce vulnerability. Examples of non-structural measures would be public acquisition; revised zoning codes to limit development density; construction setback lines; and post-disaster redevelopment policies that take erosion and the hurricane threat into account. Actions such as these, used in conjunction with beach stabilization techniques, would allow us to work toward an eventual resolution of the erosion problem. Public funds one day would no longer be needed to protect private investment in hazardous coastal areas. The current approach offers no such assurances.

In summary, the Pinellas County project may be desirable in that it would protect a sizeable public and private investment. However, it provides stopgap actions rather than long-term solutions. Non-structural measures are needed which will reduce vulnerability, both to beach erosion and storms. Until this is done, public money, like the sand it pays for, will be continually eroded away.

If there are any questions regarding this matter, please do not hesitate to call Gordon Guthrie in the Department's Bureau of Emergency Management.

NL/gmu

cc: Walter Kolb

OFFICE OF THE SECRETARY
2571 EXECUTIVE CENTER CIRCLE, EAST • TALLAHASSEE, FLORIDA 32301 (904) 488-8466

FLORIDA GAME AND FRESH WATER FISH COMMISSION

FARRIS BRYANT BUILDING
620 South Meridian Street
Tallahassee, Florida 32301
(904) 488-1960

June 18, 1984

Mr. Walt Kolb
Office of the Governor
The Capitol
Tallahassee, FL 32301

FILE

RE: FL8405161223EC, DEIS,
Bch. Erosion Control
Project Review Study
for Pinellas Co., FL

Dear Mr. Kolb:

The Office of Environmental Services has reviewed the referenced project and has no comments.

If we may offer further assistance, please contact us.

Sincerely,

Douglas B. Bailey

Douglas B. Bailey
Assistant Director,
Office of Environmental
Services

DBB/ms
ENV. 1-3-2

File

FLORIDA DEPARTMENT OF STATE
George Firestone
Secretary of State
DIVISION OF ARCHIVES,
HISTORY AND RECORDS MANAGEMENT
The Capitol, Tallahassee, Florida 32301-8020
(904) 488-1480

RECEIVED
JUN 8 1984

May 31, 1984

In Reply Refer to:

Mr. Frederick P. Gaske
Historic Sites Specialist
(904) 487-2333

Mr. Walter O. Kolb
Division of State Planning
Department of Administration
Office of the Governor
The Capitol
Tallahassee, Florida 32301

Re: Your Memorandum of May 16, 1984
Cultural Resource Assessment Request
SAI FL 8405161223EC; Draft Beach Erosion Control Project Review Study and Environmental Impact Statement, Pinellas County, Florida

Dear Mr. Kolb:

In accordance with the procedures contained in 36 C.F.R., Part 800 ("Procedures for the Protection of Historic and Cultural Properties"), we have reviewed the above referenced project for possible impact to archaeological and historical sites or properties listed, or eligible for listing, in the National Register of Historic Places. The authorities for these procedures are the National Historic Preservation Act of 1966 (Public Law 89-665) as amended by P.L. 91-243, P.L. 93-54, P.L. 94-422, P.L. 94-458 and P.L. 96-515, and Presidential Executive Order 11593 ("Protection and Enhancement of the Cultural Environment").

A review of the Florida Master Site File indicates that the Fort DeSoto Batteries (8Pi48), a property listed in the National Register of Historic Places, is recorded in the Mullet Key project area (see enclosed map). However, since the proposed project would serve to protect the Fort DeSoto Batteries from beach erosion, it is the determination of this office that the proposed activities will have no effect on the qualities of the Fort DeSoto Batteries which qualified it for listing in the National Register of Historic Places.

No other archaeological or historic sites are recorded in the project areas. Furthermore, because of their locations, it is considered highly unlikely that any unrecorded, significant sites exist in these areas. Therefore, it is the opinion of this office that the proposed project will have no effect on any sites listed, or eligible for listing, in the National Register of Historic Places, or otherwise of national, state or local significance.

If you have any questions concerning our comments, please do not hesitate to contact us.

Your interest and cooperation in helping to protect Florida's archaeological and historical resources are appreciated.

Sincerely,

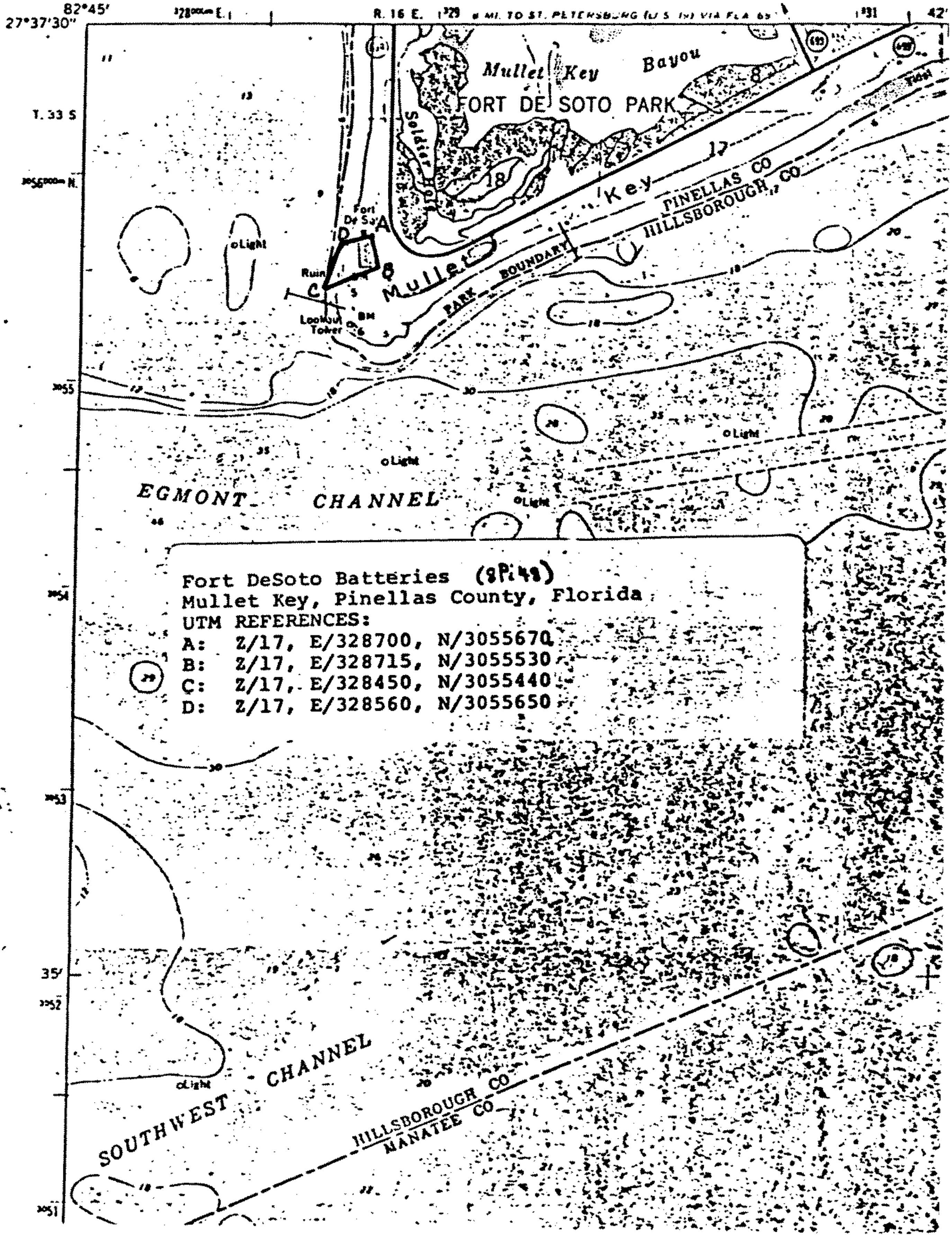
Louis D. Tesar

for George W. Percy
State Historic
Preservation Officer

GWP:Gsb

Enclosure

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



State of Florida

Department of Natural Resources Interoffice Memorandum

file

June 22, 1984

RECEIVED

MEMORANDUM

TO : Walt Kolb, Sr. Governmental Analyst
Office of the Governor

FROM : Dale Adams, Administrative Assistant
Division of Resource Management

SUBJECT: Draft EIS, Beach Erosion Control Project for Pinellas County - FL8405161223EC

I have reviewed the Draft EIS which proposes dredging from borrow sites, inlets or passes to renourish several beach areas. I would like to offer the following comments on this project:

1. Since sea turtles do nest on Pinellas County beaches, nourishment activities should be restricted during sea turtle nesting activities (May-August). Subsequent nest hatching can occur as late as early December. In order to permit renourishment during any of this period, beach monitoring for nests must begin in May. Personnel trained in nest translocation must walk the beach planned for nourishment once per day, in early morning, to mark nest sites and subsequently move them to a safe area. Translocation must take place within 48 hours ofter the nest was laid to insure hatching survival.

2. There are concerns regarding the use of the offshore borrow sites as donor areas for beach renourishment. Those areas indentified are generally shallow water nearshore areas which have viable infaunal communties. No consideration is given to these communities or to other elements of the marine food web which would be impacted. This aspect should be addressed in the final report. It would appear more appropriate to obtain fill from channel and pass maintenance dredging.

3. The report indicated that the use of vegetation to stabilize the beaches is inappropriate since beach grasses are unsightly. This seems in to be an inappropriate statement. Sea oats and other beach plants are highly effective at holding existing and trapping new sand in a beach system. Every attempt should be made to incorporate native vegetation in beach rebuilding schemes.

4. It appears that this Draft EIS does not consider possible circulation changes due to offshore borrow pits. Significant circulation pattern alterations might occur, especially in the southern borrow areas if these areas are dug out. Any circulation changes could impact both biological and physical characteristics of adjacent Gulf and bay areas and should be fully discussed.

Attached, as additional information, is copy of correspondence from the Division of Beaches and Shores to the Corps regarding this project.

The concerns listed above have not been adequately addressed in the Draft EIS. If the final EIS does not adequately address these concerns, this Department will probably find it inconsistent with the Coastal Zone Management Plan.

JDA/amm

State of Florida
DEPARTMENT OF NATURAL RESOURCES

DR. ELTON J. GISSENDANNER
Executive Director
Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard, Tallahassee, Florida 32303

June 5, 1984

Mr. A. J. Salem, Chief
Planning Division
Department of the Army,
Jacksonville District
Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232

RE: Draft Beach Erosion Control Project Review Study and Environmental Impact Statement for Pinellas County

Dear Mr. Salem:

This is in response to your letter and enclosed draft report of May 11, 1984. Review of the draft report has been made by the Division of Beaches and Shores' staff. Please be informed that all erosion control projects which extend wholly or partially seaward of the mean high water line onto state-owned, sovereignty lands require a coastal construction permit pursuant to Section 161.041, Florida Statutes.

The report contains analyses and consideration for beach restoration from dredging of inlets and passes in the County, but no discussion is contained in the report as to Federal responsibilities related to dredging and maintenance of the inlets. It is not clear whether beach restoration sand material from inlets is to be dredged for restoration or that the sand is a by-product obtained as a result of necessary dredging. The cost analysis does not distinguish between the two.

The Florida Legislature appropriated $414,375 as the state share for the Redington Beach portion of the recommended project. These funds are expected to be near contract by the last quarter of 1984. The 1984 legislature is expected to appropriate $318,000 as the state share of the Envoy point (northern Long Key) portion and $95,000 as the state share of the Hurricane Pass portion of the recommended project. The Department expects to receive other project funding applications for legislative consideration for FY 1985-87.

In general, the Department supports the recommendations outlined in the draft report and would be very interested in reviewing the final report when it is completed.

If you have any questions, please feel free to contact me at the letterhead address or by phone at (904)488-3180.

Sincerely,

Deborah E. Flack

Deborah E. Flack, Director
Division of Beaches and Shores

DEF/mlb

cc: Mr. Dale Adams (FL8405161223EC)
Mr. Lonnie Ryder
Mr. Mark E. Leadon

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

June 26, 1984

GOVERNOR'S OFFICE
Planning and Budgeting
Intergovernmental Coord.

JUN 27 1984

RECEIVED

Mr. Ron Fahs, Director
Intergovernmental Coordination
Office of Planning and Development
Clearinghouse
Office of the Governor
421 Carlton Building
Tallahassee, Florida 32301

Dear Mr. Fahs:

Re: Draft Beach Erosion Control Project Review Study and Environmental Impact Statement for Pinellas County, Florida, SAI No. FL8405161223EC

The Department of Environmental Regulation has reviewed the referenced document and offers the following comments and suggestions.

1) It is difficult to determine whether the selected alternative includes breakwaters located off of Sand Key and Long Key or just off one of the two islands. Page 83 of the BEC and page EIS-11 seem to contradict each other.

   The impact of breakwaters on adjacent beaches is not adequately described in the document. Although these structures may help to prolong the life of the beaches immediately in front of them, they may contribute to erosion of adjacent beach fronts. The final EIS should discuss the effects of the proposed breakwaters on adjacent beaches.

2) As Caladesi Island is in an aquatic preserve, is managed as a State Recreation Area, and has limited access (3,000 people per day), we suggest that renourishment on this island be avoided. We do not support the nourishment of beach fronts that are not experiencing erosion. They should not become convenient disposal areas for dredged material. Foregoing nourishment on Caladesi Island would provide a relatively undisturbed, natural area for recreationists to enjoy.

3) Enclosed are comments concerning water quality, habitat destruction and borrow areas from Mr. Larry Devroy of our Southwest District Office in Tampa. These comments should be addressed in the final EIS.

4) Nonstructural alternatives to beach nourishment and restoration are mentioned as options that cannot control beach erosion. The importance of these alternatives, which can provide long-term protection against loss of life and property, is not stressed. One of the alternatives discussed in the analysis of options should have included both structural and nonstructural methods of combating beach erosion problems.

5) A major concern with this proposed project is the cumulative impacts of the erosion control activities on the Gulf region's natural resources. We suggest that comparative investigations be made to determine the effectiveness of similar projects and their impacts on near shore fish species and their habitats.

6) The timing of this proposed project, if constructed, should avoid major spawning and migrations of marine life. We recommend that project construction take place during the late winter months (December, January, February). A description of the bottom habitat at the proposed breakwater locations should be provided. In the event that these locations include extensive live bottoms, we recommend that the breakwaters not be constructed over these areas.

7) Other minor comments:

   a) We suggest that when possible, vessels involved in the project have prop guards to further protect manatees from injury (see p. 6 of the Section 404 Evaluation Report).

   b) The initial costs of the proposed project are not included in any of the B/C ratios. The millions of dollars needed for initial restoration and construction should be accounted for somewhere in the B/C analysis.

   c) The B/C ratio for the Long Key segment of the project should be 2.0 not 2.7 (p. D-69).

   d) Although benthic organisms are expected to recolonize in renourished areas, the same species will only recolonize if the new substrate is identical to the old one. Grain size of the fill material must match the original to assure continuation of the same species. (See pp. 81-82 of the BEC.)

   e) Acreages of areas to be restored and renourished should be provided.

8) The proposed construction will require permits from the department, pursuant to Chapters 253 and 403, Florida Statutes, and water quality certification under Public Law 92-500. Project plans should be coordinated with our Southwest District Office in Tampa.

9) Although we agree with the U.S. Army Corps of Engineers' determination that the proposed construction is consistent with the DER's statutory authorities in the Florida Coastal Management Program, we request a much more detailed determination in the final document. The consistency determination should specifically state how the project is consistent with the State of Florida's rules and regulations. The essential ingredients and appropriate format of the determination are described in 15 CFR Part 930, Subpart C, Sections 930.32, .34, .37 and .39.

Thank you for providing us with the opportunity to review this document.

Sincerely,

Heather L. Nixon

Heather L. Nixon
Environmental Specialist
Intergovernmental Programs
Review Section

HLN/jb

Enclosure

cc: Larry Devroy
Tom Swihart

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee		
To:	Loctn.:	
To:	Loctn.:	
To:	Loctn.:	
From:	Date:	
Reply Optional [ ]	Reply Required [ ]	Info. Only [
Date Due:	Date Due:	

RECEIVED
JUN 15 1984
DIVISION OF ENVIRONMENTAL PERMITTING

TO: John Outland

THROUGH: William Kutash

FROM: Larry Devroy L.D.

DATE: June 12, 1984

Several aspects of this specific beach erosion control project proposal need clarification to assure compliance with water quality criteria:

1. Detailed analysis of proposed borrow areas indicating existing biological nature and grain size must be accomplished.

2. Detailed analysis of existing biota in areas of beach proposed to be nourished.

3. Potential impacts on migratory patterns, nursery grounds and habitat of species including but not limited to scaled sardines, gulf kingfish, anchovies, pompano, sea turtles, blue crabs and other vertebrate and invertebrates utilizing the surf zone on a daily and seasonal basis.

Further, previous beach renourishment projects have lead to long term increases in turbidity levels, not only during the several months typically involved in construction but for years afterward. This extreme long term reduction in transparency is due to the unnatural grain size distribution of nourishment material which results in continual release of fines except during the calmest conditions. On several flyovers, this field inspector has observed a strong correlation between the turbid surf zones off Pinellas County and previous beach nourishment projects.

Finally, the agency requests periodic sampling during the project to assess cumulative impacts and to determine if impacts contrary to Chapter 258, F.S. "Aquatic Preserve" or the Outstanding Florida Waters designation of Pinellas County have occurred.

LD/mh

STATE OF FLORIDA **FLORIDA DEPARTMENT OF AGRICULTURE & CONSUMER SERVICE**

DOYLE CONNER, COMMISSIONER * DIVISION OF FORESTRY / ~~XXXXXXXXXXXXXX~~ 3125 Conner Blvd. / TALLAHASSEE ~~XXXXX~~ 32301

file

DATE: May 22, 1984

RECEIVED MAY 25 1984

Mr. Walter Kolb
Office of Planning and Budgeting
Office of the Governor
The Capitol
Tallahassee, Florida 32301

Dear Walt:

We have reviewed the EIS referral transmitted in your letter of 5/16/84 on SAI Project # * and are advising you that the Division of Forestry has no adverse comment.

If we can be of further assistance, please give us a call.

Sincerely yours,

George

George L. Reinert
Chief, FREP Bureau
488-6591

* FL 8405161223EC - Beach Erosion Control Project Review Study for Pinellas County, Florida

STATE OF FLORIDA DEPARTMENT OF COMMERCE
Division of Economic Development Collins Building, Tallahassee 32301

RECEIVED
JUN 11 1984

June 8, 1984

Mr. Walt Kolb
Office of Planning
and Budgeting
Office of the Governor
The Capitol
Tallahassee, Florida 32301

RE: SAI#8405161223EC

Dear Mr. Kolb:

The Florida Department of Commerce has reviewed the Corps Beach Erosion Control Study for Pinellas County. The study area presents a mix of undeveloped state-owned barrier islands and highly-developed resort and residential beachfronts. The recommended project alternative is consistent with the goals and policies of the FDC since it supports tourism by ensuring the preservation of beaches in Pinellas County's resort and recreational areas.

Sincerely,

Leonard T. Elzie, Chief
Bureau of Economic Analysis

LTE:jhb

Bureau of Area Development 904/488-9357 | Bureau of Economic Analysis 904/487-2568 | Director's Office 904/488-6300 | Bureau of Trade Development 904/488-9050 | Bureau of Industry Development 904/488-9360

Correspondence from Federal Agencies

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

OFFICE OF THE ADMINISTRATOR

July 12, 1984

Mr. A. J. Salem
Chief, Planning Division
Jacksonville District, Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232

Dear Mr. Salem:

This is in reference to your draft environmental impact statement for the proposed beach erosion control project at Pinellas County, Florida. Enclosed are comments from the National Oceanic and Atmospheric Administration.

We hope our comments will assist you. Thank you for giving us an opportunity to review the document. We would appreciate receiving four copies of the final environmental impact statement.

Sincerely,

Thomas S. Bigford for

Joyce M. Wood
Chief, Ecology and
Conservation Division

Enclosure

DC:das

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Washington, D.C. 20230

N/MB21:VLS

July 10, 1984

TO: PP2 - Joyce M. Wood

FROM: N - Paul M. Wolff

SUBJECT: DEIS 8405.23 - Beach Erosion Control Project, Pinellas County, Florida (Corps of Engineers - Jacksonville District)

The subject statement has been reviewed within the areas of the National Ocean Service's (NOS) responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

Our Office of Ocean and Coastal Resource Management (OCRM) has been in contact with Mr. Walt Kolb of the Florida Department of Environmental Regulation. Based on a preliminary review, Mr. Kolb stated that the Department does not feel that the Federal consistency issue was given enough consideration and one of their recommendations to the Corps will be that the CZM statutes impacting this proposed project be more specifically identified and addressed.

DC
7/11

U.S. Department of Housing and Urban Development
Atlanta Regional Office, Region IV
Richard B Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303

June 22, 1984

Mr. A. J. Salem, Chief, Planning Division
Attention: Coastal Branch
DOA - Jacksonville District Corps of Engineers
Post Office Box 4970
Jacksonville, FL 32232

Dear Mr. Salem:

We have reviewed the Draft EIS for the Beach Erosion Control Study of Pinellas County, Florida and find the EIS has adequately addressed any concerns HUD might have. The restoration and nourishment of the public beach areas will expand an important recreational activity in Pinellas County.

We appreciate the opportunity to comment on this Draft EIS.

Sincerely,

for Ivar Iverson
Regional Environmental Officer

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333
June 19, 1984

District Engineer
U.S. Army Corps of Engineers
Post Office Box 4970
Jacksonville, Florida 32232

Dear Sir:

We have reviewed the Draft Environmental Impact Statement (EIS) for the Beach Erosion Control Project Review Study for Pinellas County, Florida. We have reviewed this document for potential health effects on behalf of the U.S. Public Health Service and have only one comment to offer.

Have any analyses been conducted on the material to be dredged and used for the beach nourishment? If not, then these analyses should be made to determine whether the sediments may contain any material that might pose a health hazard.

Thank you for the opportunity of reviewing this Draft EIS. Please send us a copy of the Final EIS when it becomes available.

Sincerely yours,

Stephen Margolis

Stephen Margolis, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW

Southeast Region / Suite 1360
Richard B. Russell Federal Building
75 Spring Street, S.W. / Atlanta, Ga. 30303

Telephone 404/221-4524 - FTS: 242-4524

JUN 20 1984

ER-84/691

Colonel Alfred B. Devereaux, Jr.
Commander
U.S. Army Engineer District, Jacksonville
Post Office Box 4970
Jacksonville, Florida 32232

Dear Colonel Devereaux:

This is in response to a letter dated May 11, 1984, from the Chief of your Planning Division, for our comments on the draft report and environmental impact statement (EIS) for beach erosion control at Pinellas County, Florida.

Informal consultation pursuant to Section 7 of the Endangered Species Act of 1973, as amended, was concluded on August 16, 1983, (FWS Log No. 4-1-83-153), and provides for modification of the project to include protective measures for manatee and sea turtles. Unless project conditions or plans change or unless additional or new impacts to listed species are identified, further consultation is not required for this project.

The Fish and Wildlife Service would like their letter reports on this project added to the appendix. These include a planning-aid report on Sand Key dated February 6, 1980, a report on Treasure Island dated April 22, 1982, and a report on EIS preparation, dated January 31, 1983.

Thank you for the opportunity to comment on the draft documents.

Sincerely yours,

James H. Lee

James H. Lee
Regional Environmental Officer

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

JUL 05 1984

4PM-EA/GM

Colonel Alfred B. Devereaux, Jr.
District Engineer
U.S. Army Corps of Engineers
P. O. Box 4970
Jacksonville, Florida 32232

Dear Colonel Devereaux:

We have reviewed the Draft Environmental Impact Statement (EIS) for the Beach Erosion Control Project Review Study for Pinellas County, Florida. Since this kind of project appears to be increasing in frequency within your district, we would like to provide you with our perspective of the long-term consequences of these type actions.

Attempts at stabilizing coastal shorelines through the renourishment activities envisioned in the selected alternative almost always adversely affect the processes which maintain the natural beach/dune system. This should not be construed to mean that renourishment has absolutely no merit, but there is a very real probability that its application in Pinellas County could, in fact, ultimately reduce the size of the subject recreational beaches. This potentiality is not given appropriate emphasis in the document. The alteration of natural storm response mechanisms of beaches and the natural migration characteristics of barrier islands are also left largely unmentioned. These phenomena are not of just academic interest since they fundamentally influence the future utility and even the existence of the artifically nourished beaches.

Since the Corps of Engineers is at the forefront of both research and execution of these stabilization activities, we believe that EIS's dealing with same would be improved by a discussion of the recognized long range adverse impacts of shoreline stabilization. To adequately allow the general public and particularly the involved users and landowners of the subject beaches, in Pinellas County the opportunity to evaluate all the consequences of beach nourishment, the following factors should be discussed:

- How will the Pinellas shoreline respond to rising sea level during the project life? Even more importantly, what additional engineering/structural measures will be necessary to maintain the beach in the face of this rising water?

- The impact of various structures already in place between the low and high tide lines within the project boundaries should be examined. Of particular interest would be the interaction of seawalls/groins on intensifying the effects of wave energies and longshore currents on the proposed artificial beach.

- Similarily, what effects will the numerous bulkheads and revetments in the project area have on the artificial beach system during storm activities? It is important to note that the consequences of these structures on erosion is not always immediately apparent, but can be pronounced due to irreversible sand loss during these storm events.

- The potential implications that this project will have on fostering erosional processes and shoreline instability on down current beaches needs to be, at least, qualitatively examined. Reciprocially, similar stabilization activities up current of this project need to be evaluated for potentially complicating influences on the proposed Pinellas facility.

- The interaction of subsequent development activities and the shoreline should not be overlooked in the Final EIS. After the initial beach replenishment it has been our experience that property values increase and single unit housing is often replaced by multiple units or even high rise construction. Since the nourishment material generally results in oversteepening the overall beach profile, a natural equilibrium slope must be reconstituted at decreasing intervals. Hence, a situation is reached in which ever more elegant and costly stabilization measures are needed to protect the investments made in response to the initial nourishment. The $65 million cost to renourish Miami Beach gives some insight as to where this process can lead.

The final document would be materially improved if the above issues were addressed. Additionally, the ultimate decision-maker(s) would be given all the information necessary to make a reasoned determination with a knowledge of all the facts. On the basis of our review a rating of EC-2 is assigned. That is, we have some conceptual environmental concerns about this proposal and request some additional insights on the issues we raised above.

If we can be of further assistance, please do not hesitate to contact Dr. Gerald Miller at FTS 257-7901.

Sincerely yours,

Sheppard N. Moore

Sheppard N. Moore, Chief
Environmental Review Section
Environmental Assessment Branch

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Region
9450 Koger Boulevard
St. Petersburg, FL 33702

May 1, 1984 F/SER23:AM:cf

Mr. A. J. Salem
Chief, Planning Division
Jacksonville District
Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232

Dear Mr. Salem:

This responds to your April 20, 1984, letter regarding the addition of the western shoreline of Mullet Key to the feasibility study of Beach Erosion Control for Pinellas County, Florida. You advised that the addition of the Mullet Key segment would not change your previous determination of "no effect" on endangered/threatened species under the purview of the National Marine Fisheries Service.

We have reviewed the information provided and concur with your determination that the addition of Mullet Key to your study would not change the conclusions reached in your May 12, 1983, Biological Assessment on "Threatened and Endangered Species Considerations, Beach Restoration and Erosion Control Project, Gulf Coast of Pinellas County, Florida".

This concludes consultation responsibilities under Section 7 of the Endangered Species Act of 1973. However, consultation should be reinitiated if new information reveals impacts of the identified activity that may affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified or critical habitat determined that may be affected by the proposed activity.

Sincerely yours,

Chuck Oravetz

Charles A. Oravetz, Chief
Protected Species Management Branch

United States Department of the Interior
FISH AND WILDLIFE SERVICE
P.O. Box 2676
Vero Beach, Florida 32961-2676

January 26, 1984

Mr. A. J. Salem
Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Fl. 32232

Attn: R. Tapp

Dear Sir:

This letter is provided to enable you to take proper steps to comply with the recently passed Coastal Barriers Resources Act as it applies to your Pinellas County Beach Erosion Control Project Study. The study covers the entire shoreline of Pinellas County.

You have been surveying the County to determine the major erosion areas and decide what steps are necessary such as periodic sand nourishment, groins, or offshore breakwaters.

As we understand, the major areas of erosion are on Sands Key, Treasure Island, and Mullet Key.

Units of the coastal barrier resources system in Pinellas County are:

Unit 24 - The Reefs
Unit 24A - Clearwater Beach Island

It appears that none of your plans would impact these units, as we understand them. If, however, the Pinellas County Beach Erosion Project or Dunedin Pass Navigation Project plans should include dredging in Dunedin Pass with spoil on Clearwater Beach or Captiva Island, this would have potential for impacting Unit 24A and consultation with our Regional Director under Section 6 of the Coastal Barriers Resources Act of 1982 would be appropriate.

I hope this satisfies your immediate needs.

Sincerely yours,

Joseph D. Carroll, Jr.
Field Supervisor

cc:
ARD-HR, FWS, Atlanta, Ga.

SAJPD-ES

24
~~13~~ May 1983

Mr. Jack T. Brawner
Regional Director
National Marine Fisheries Service
9450 Koger Boulevard
St. Petersburg, Florida 33702

Dear Mr. Brawner:

The Biological Assessment addressing the probable effects of the proposed Pinellas County Beach Erosion Control project on listed species of interest to your agency that could be present in the project area is inclosed.

The Corps has concluded the proposed action will not affect any listed species. This completes coordination under the Endangered Species Act unless new information should indicate the proposed action may affect listed species or their habitats, or a new species is listed that may be affected by the action, or you request consultation.

Sincerely,

1 Incl
As stated

A. J. SALEM
Chief, Planning Division

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Region
9450 Koger Boulevard
St. Petersburg, FL 33702

May 31, 1983

Mr. A.J. Salem
Chief, Planning Division
Jacksonville District, Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232

Dear Mr. Salem:

This responds to your May 24, 1983, letter regarding the proposed Pinellas County Beach Erosion Control project for Honeymoon Island, Clearwater Beach Island, Sand Key, Long Key, Treasure Island, and Caladesi Island, Florida. A biological assessment (BA) was transmitted pursuant to Section 7 of the Endangered Species Act of 1973 (ESA).

We have reviewed the BA and concur with your determination that populations of endangered/threatened species under our purview would not be adversely affected by the proposed action.

This concludes consultation responsibilities under Section 7 of the ESA. However, consultation should be reinitiated if new information reveals impacts of the identified activity that may affect listed species or their critical habitat, a new species is listed, the identified activity is subsequently modified or critical habitat determined that may be affected by the proposed activity.

Sincerely yours,

Charles A. Oravetz

Charles A. Oravetz, Chief
Protected Species Management Branch

SAJPD-ES

12 May 1983

BIOLOGICAL ASSESSMENT
THREATENED AND ENDANGERED SPECIES CONSIDERATIONS
BEACH RESTORATION AND EROSION CONTROL PROJECT
GULF COAST OF PINELLAS COUNTY, FLORIDA

1. The proposed project (see attachments) is to restore the western shorelines of four barrier islands and to periodically discharge nourishment fills on those four islands and two other barrier islands. The subject islands are Sand Key, Treasure Island, Clearwater Beach Island, Long Key, Honeymoon Island, and Caladesi Island. Breakwaters and/or groins are being considered for use to stabilize the fills. Two off-shore shoals and shoals adjacent to the subject islands will be hydraulically dredged to obtain the required fill materials.

2. Study methods included literature review. The needed data was obtained without difficulty.

3. The project is not likely to affect manatees because of the nature and location of the proposed work. The project contract will be conditioned to restrict project-boat speeds to avoid injuring manatees. The project waters are unlikely to harbor any endangered sea turtles of the type known to pass through the area (Loggerhead, Leatherback, Hawksbill, and Kemp's Ridley). The project passes are fast-water passes; therefore, sea turtles are not likely to burrow in the pass dredging areas. No injury to sea turtles are anticipated in the open sea dredging areas or in the vicinity of the beach discharge areas. No portion of the project is likely to be capable of injuring any endangered whales that are known to pass through the area (Right, Blue, Sei, Fin, Humpback, and Sperm). The dredge barges will be slow movers or stationary, all dredging will be by the hydraulic method, and the shuttle support boats will be required to operate at "no wake" speeds between the islands and the mainland. There is no critical habitat in the project area. (The Endangered Species Act of 1973 as amended December 1978).

4. The above survey results leads to the conclusion of no effect on any listed threatened or endangered species.

Attachments: (a) Project Description
(b) Project Location Map

(a) PROJECT DESCRIPTION

(a) The western shores of four Pinellas County barrier-islands (Honeymoon Island, Clearwater Beach Island, Sand Key and Long Key) will receive initial restoration fills.

1. Honeymoon Island: Initial restoration along 5,000 feet of shoreline will require the discharge of 80,000 cy of material hydraulically dredged from Hurricane Pass. Federal Project maintenance dredging will provide 15,000 cy of beach nourishment material annually.

2. Clearwater Beach Island: Five thousand feet of the western shoreline will be restored with 100,000 cy of material dredged from shoal number one or from Federal Project maintenance dredging in Clearwater Pass. The same maintenance dredging will provide 10,000 cy of beach nourishment material annually.

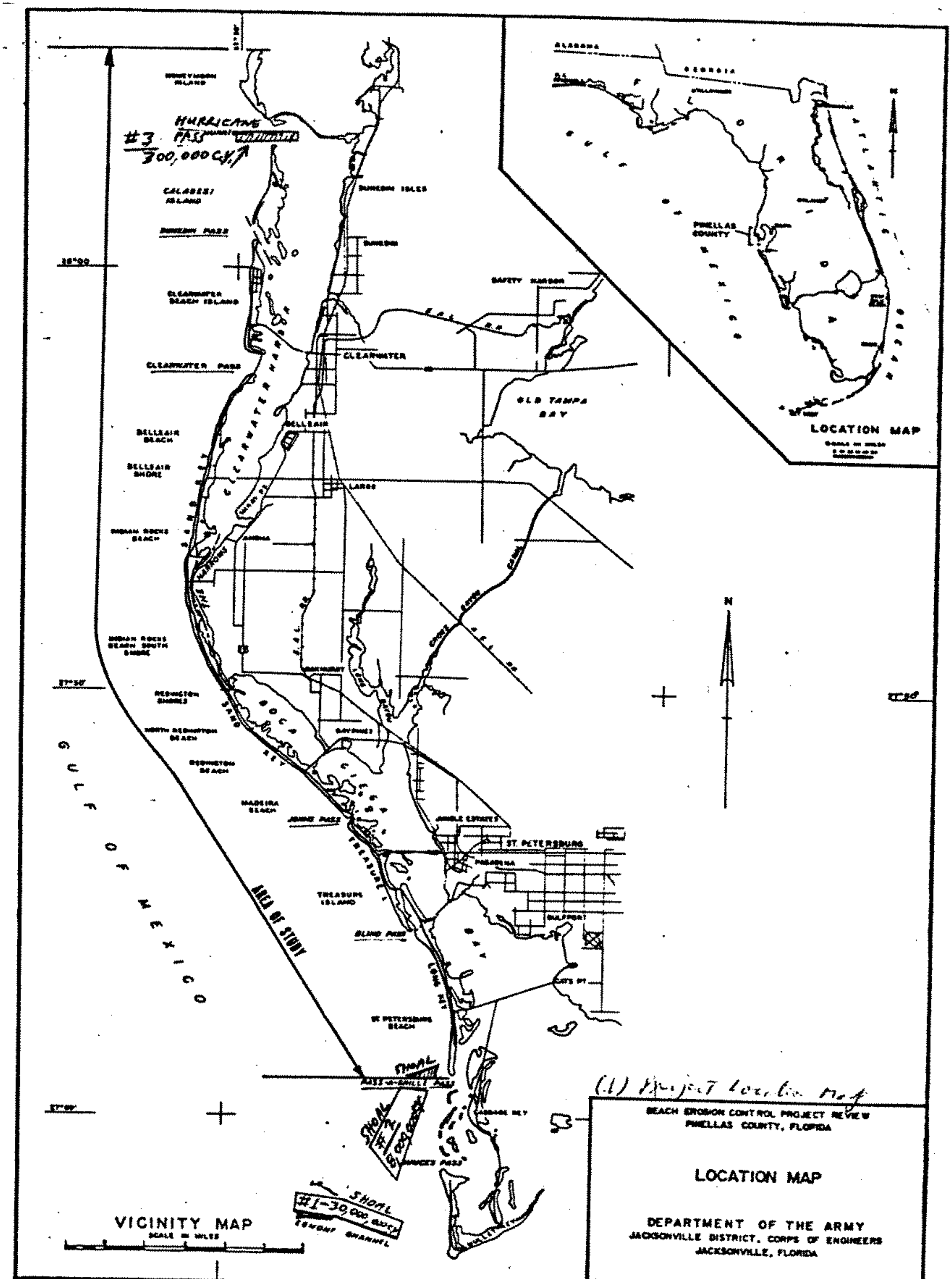
3. Sand Key: Initial restoration of 10.2 miles of shoreline will be performed using 3,000,000 cy of material from shoal no. 1. Five year nourishment fills will require 300,000 cy of material to be supplied by Federal Project maintenance dredging in Johns Pass.

4. Long Key: Restoration of 2,500 feet of shoreline will require 100,000 cy of material from shoal no. 1 or Blind Pass. An offshore stone or sand breakwater is also being considered. Long Key was restored in 1979 when 143,000 cy of material from Blind Pass was discharged along 2,600 feet of shoreline, and 100,000 cy of material was used to form an offshore breakwater. The Pass-a-Grille groin will be rehabilitated in 1983. Annual nourishment fill will require 50,000 cy of material from Federal Project maintenance dredging in Blind Pass or from shoal no. 1.

(b) Two other barrier-islands (Treasure Island and Caladesi Island) will receive periodic nourishment fills.

1. Treasure Island: Initial restoration of 9,200 feet of shoreline was performed in 1969 by the discharge of 682,000 cy of dredged material obtained from an offshore borrow area and from Blind Pass. In 1971, the restoration fill area was extended for 2,000 feet with 75,000 cy of material obtained from the north end of the island. Nourishment fill was applied in 1972 with the discharge of 155,000 cy of material along the southern 2,000 feet of shoreline. In 1976, the southern 9,000 feet was nourished with 380,000 cy from an offshore borrow site, and groin no. 1 was completed. Construction of groin no. 2 was partially completed. In 1978, groin no. 2 was raised 2.5 feet with 50,000 cy of material from Blind Pass. In 1983, the groin at Blind Pass will be lengthened by 160 feet, and the southern 4,200 feet of shoreline will be nourished with 200,000 cy of material from Blind Pass. Approximately 50,000 cy of material from shoal no. 1 or Blind Pass will be needed annually to nourish the shoreline.

2. Caladesi Island: Approximately 10,000 cy of material from Hurricane Pass will be used annually for beach nourishment on an as needed basis.



HONEYMOON ISLAND
HURRICANE PASS
#3 300,000 C.Y.
CALADESI ISLAND
DUNEDIN PASS
DUNEDIN ISLES
DUNEDIN
SAFETY HARBOR
CLEARWATER BEACH ISLAND
CLEARWATER HARBOR
CLEARWATER PASS
CLEARWATER
OLD TAMPA BAY
BELLEAIR
BELLEAIR BEACH
BELLEAIR SHORE
LARGO
INDIAN ROCKS BEACH
INDIAN ROCKS BEACH SOUTH SHORE
REDINGTON SHORES
NORTH REDINGTON BEACH
REDINGTON BEACH
BOCA CIEGA BAY
SAND KEY
MADEIRA BEACH
JOHNS PASS
ST. PETERSBURG
PASADENA
TREASURE ISLAND
BLIND PASS
GULFPORT
LONG KEY
ST PETERSBURG BEACH
GULF OF MEXICO
AREA OF STUDY
SHOAL
PASS-A-GRILLE PASS
SHOAL #2
MULLET KEY
SHOAL #1-30,000
EGMONT CHANNEL
N
VICINITY MAP
SCALE IN MILES
LOCATION MAP
PINELLAS COUNTY
ALABAMA
GEORGIA
(1) Project Location Map
BEACH EROSION CONTROL PROJECT REVIEW
PINELLAS COUNTY, FLORIDA
LOCATION MAP
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

FIGURE 1

United States Department of the Interior
FISH AND WILDLIFE SERVICE
2747 Art Museum Drive
Jacksonville, Florida 32207

August 16, 1983

Mr. A. J. Salem
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232

FWS Log No. 4-1-83-153

Dear Mr. Salem:

This responds to your letter of July 6, 1983, providing additional information on the proposed Pinellas County, Florida, Beach Erosion Control Project. The project has been modified to incorporate a sea turtle nest survey and relocation program which would begin 60 days prior to any construction or equipment mobilization on the beach between April and September.

Based upon this action, the Fish and Wildlife Service concurs in your determination that the proposed action will not affect any listed species. This letter supplements our letter of June 24, 1983 concerning the same project. Although this does not constitute a Biological Opinion described under Section 7 of the Endangered Species Act, it does fulfill the requirements of the Act and no further action is required. If further modifications are made in the project or if additional information involving potential impacts on listed species becomes available, please notify our office.

We wish to point out one misstatement of facts in your letter of July 6. In your second paragraph you state that, "The U.S. Fish and Wildlife Service has delegated authority to the State of Florida to permit the taking of Threatened or Endangered species." Attached is a copy of the Fish and Wildife permit to the the Florida Department of Natural Resources which authorizes the taking, for scientific purposes and for enhancement of propagation and survival, four species of sea turtles. This permit does not constitute a delegation of authority although the Florida Department of Natural Resources is authorized to name subpermittees to act in their behalf as agents of the State in carrying out the terms of the permit. This permit does not extend to any species beyond the four listed turtles.

Should you have any further questions concerning this letter, please contact Mr. Don Palmer, Consultation Team Leader, at FTS 946-2580.

Sincerely yours,

Don Palmer for

David J. Wesley
Field Supervisor
Endangered Species Field Station

SAJPD-ES 6 July 1983

[illegible]

Dear Mr. Wesley:

The Corps has revised its conclusion concerning the proposed Pinellas County, Florida Beach Erosion Control project's possible effect on nesting sea turtles in the project area based on the information supplied by your letter of 24 June 1983. The Draft Environmental Impact Statement for this study will reflect this revision. The Corps will specify a requirement, in any Federal Project Contract let for this project, to perform the following protective measures during contracted project activities.

The U.S. Fish and Wildlife Service has delegated authority to the State of Florida to permit the taking of threatened or endangered species. The Florida Department of Natural Resources (FDNR) permits, regulates, and monitors the taking of such species. FDNR controls egg recovery operations by specifying the qualifications of the recovery personnel and the procedures they are to use. Any Pinellas County Beach Erosion Control Federal Project dredge and fill contract will be specially conditioned by the Corps of Engineers to hold the contractor responsible for daily dawn patrols of the entire beach work area for the purpose of locating, taking, and incubating turtle eggs and for the release of turtle hatchlings in accordance with the conditions of a FDNR permit. If work is scheduled from April to September the contractor will be required to begin the [illegible] 60 days before begin-[illegible]

[illegible]

A. J. SALEM
Chief, Planning Division

United States Department of the Interior
FISH AND WILDLIFE SERVICE
2747 Art Museum Drive
Jacksonville, Florida 32207

June 24, 1983

Mr. A. J. Salem
Chief, Planning Division
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232

FWS Log No. 4-1-83-153
Pinellas County Beach Erosion
Project

Dear Mr. Salem:

This office has reviewed your letter and attached information of May 24, 1983, pursuant to Section 7 of the Endangered Species Act of 1973, as amended, regarding the proposed Pinellas County Beach Erosion project. You have considered project impacts on the brown pelican, bald eagle, West Indian manatee and nesting sea turtles and concluded that there would be no effect on any of these listed Threatened or Endangered species.

Concerning the manatee, you have indicated that the standard contract conditions requiring operation procedures to minimize potential effects on manatees will be made a part of this project. Based on the information furnished with your letter, we concur with your assessment of potential project effects on the pelican, bald eagle and manatee.

We strongly disagree however, with your assessment of potential impacts to nesting sea turtles. As stated in your letter, no protective actions for sea turtles are planned. This is based on your assumption that 0.1% (estimate of affected nests) of the total sea turtle nesting activity in Florida is insignificant to the population and presumably may be treated as an allowable taking. You have derived the 0.1% figure based on Carr's 1976 estimates for the area (0.2% of statewide nesting) divided by the portion of Pinellas County's beaches (60%) which will be included in the project.

The project elements have been summarized in the attached table indicating that a minimum of 12.5 miles of beach will be effected.

Our concern for sea turtles is based on the following:

1. Recent observations of sea turtle nesting in Pinellas County indicate a higher incidence of nesting than previously thought. Although the Pinellas County beaches have never been subjected to a systematic survey, data from the Florida Department of Natural Resources, Bureau of Marine Research, in St. Petersburg, indicate that of the 401 observed nests on Florida's west coast in 1981, about 20 occurred in Pinellas County. On Egmont Key, just south of the Pinellas-Hillsboro County line, 17 nests were recorded in a survey that was conducted only three days per week. Several beaches of Pinellas County within the project area show significant nesting activity such as Pass a Grille Beach (5 nests in 1982) and the north end of Clearwater Beach at Mandalay Shore which has already reported 5 nests in 1983. While accurate data on the total number of turtle nests in the project area is not available, it is not unreasonable to assume that at least 20 to 30 loggerheads nest in Pinellas County in any given year. The distribution of these nests in relation to the project beaches is unclear.

2. Without nest distribution data, it is invalid to assume that because 60% of the beaches will be impacted that 60% of the nesting could be lost. The impact ratio could be much higher or lower depending on the relationship of the project beaches to specific nesting areas.

3. There are no data available on which to base the assumption that 0.1% of the state's nesting is insignificant. In our view, population dynamics of sea turtles are so poorly understood as to render such a judgement impossible.

4. In establishing the relative magnitude of importance of the project beaches to sea turtle nesting, it would be much more practical to compare the nesting in Pinellas County with the other west Florida beaches as there is an incomplete understanding of the relationship between the Atlantic and Gulf turtle populations. Roughly speaking about 30 of 400 observed nests on the west coast of Florida may occur in Pinellas County or about 7.5%.

5. In view of the fact that all but one of the six identified project beaches is scheduled for maintenance nourishment on an annual basis, it is more important than ever to establish an accurate record of turtle nesting activity on project beaches. The potential for adverse effects to nesting turtles would not be a one time event, but would last indefinitely, essentially eliminating certain reaches of beach from all successful nesting for the life of the project.

In the course of a previous consultation on beach nourishment on Sand Key, a part of this overall project (FWS Log No. 4-1-80-237), the Jacksonville District indicated its intent to institute a nest survey and relocation program if beach nourishment could not be accomplished during the non-nesting season. It was the feeling of the Fish and Wildlife Service at that time that such conservation measures were warranted and should be made a part of the project.

In view of the expanded project boundary and certain knowledge of additional nesting activity which was not known at that time, we believe the institution of a nest relocation and survey program on a continuing basis is essential for this project.

There is a high level of public awareness of sea turtle conservation needs in the greater Tampa - St. Petersburg area. A number of volunteer groups and organizations presently are involved in turtle survey work. It may be possible to develop a nest survey and relocation program which could utilize some of these resources in the furtherance of conservation, community service, and public education/awareness. Mr. Allen Hoff, Florida Department of Natural Resources, Bureau of Marine Research, 100 8th Avenue, S.E., St. Petersburg, Florida 33701, phone 813/896-8626, has indicated his willingness to assist the Corps in contacting appropriate and permitted individuals to accomplish this necessary work.

Provided that either 1) beach nourishment is performed during non-nesting seasons or, 2) a nest survey and relocation program is made a part of the Federal project, we feel that the proposed project will have no effect on sea turtles and coordination under the Act will be completed, negating further action on your part. If, as is stated in your letter, no protective measures are incorporated, we feel that the work may adversely effect sea turtles and the Service will issue a biological opinion. Please advise this office of your decision in this matter as soon as possible.

In meeting the provision of "incidental take" in Section 7(b)4 of the Endangered Species Act, we have reviewed the information related to this project and based upon this review and the fact that no biological opinion has been issued, no incidental take is authorized for marine turtles during the life of the project. Should a marine turtle be taken, you must immediately initiate consultation under Section 7.

Sincerely yours,

David J. Wesley

David J. Wesley
Endangered Species Supervisor

Attachment

SUMMARY OF PINELLAS COUNTY BEACH EROSION PROJECT - 1983
AND ANTICIPATED MAINTENANCE

BARRIER ISLAND	LENGTH TO BE NOURISHED	INITIAL VOLUME AND SOURCE	MAINTENANCE VOLUME AND SOURCE	MAINTENANCE INTERVAL
Honeymoon Island	5,000 feet	80,000 c.y. Hurricance Pass	15,000 c.y. Hurricane Pass	annually
Clearwater Beach	unspecified	100,000 c.y. Clearwater Pass	10,000 c.y. Clearwater Pass	annually
Sand Key	10.2 miles	3,000,000 c.y. Offshore	300,000 c.y. John's Pass	5 years
Long Key	2,500 feet	100,000 c.y. Offshore or Blind Pass	50,000 c.y. Offshore or Blind Pass	annually
Treasure Island	4,200 feet	200,000 c.y. Blind Pass	50,000 c.y. Blind Pass	annually
Caladesi Island	unspecified	unspecified	10,000 c.y. Hurricane Pass	annually

Advance copy

SAJPD-ES

~~12~~ 27 May 1983

Mr. David W. Peterson
U.S. Fish and Wildlife Service
2747 Art Museum Drive
Jacksonville, Florida 32207

Dear Mr. Peterson:

The Biological Assessment addressing the probable effects of the proposed Pinellas County Beach Erosion project on the listed species named in your letter (copy attached) of 6 February 1981 is inclosed. Coordination under Section 7 of the Endangered Species Act was completed for the Sand Key portion of this project (Log No. 4-1-80-I-237) by your letter dated 27 August 1980 (copy attached).

The Corps has concluded the proposed action will not affect any listed species. This completes coordination under the Endangered Species Act unless new information should indicate the proposed action may affect listed species or their habitats, or the proposed action is substantively modified, or a new species is listed that may be affected by the action, or you request consultation.

Sincerely,

3 Incl
As stated

A. J. SALEM
Chief, Planning Division

SAJPD-ES

24 May 1983

BIOLOGICAL ASSESSMENT
THREATENED AND ENDANGERED SPECIES CONSIDERATIONS
BEACH RESTORATION AND EROSION CONTROL PROJECT
GULF COAST OF PINELLAS COUNTY, FLORIDA

1. The proposed project (see attachments) is to restore the western shorelines of four barrier islands and to periodically discharge nourishment fills on those four islands and two other barrier islands. The subject islands are Sand Key, Treasure Island, Clearwater Beach Island, Long Key, Honeymoon Island, and Caladesi Island. Breakwaters and/or groins are being considered for use to stabilize the fills. Hydraulically dredged material from two off-shore shoals and material obtained from Federal Project maintenance dredging in passes between some of the project islands will supply the fill materials for this project.

2. Study methods included literature review. The needed data was obtained without difficulty.

3. The Pinellas County shores are believed but not documented, to be used for sea turtle nesting at a frequency of 0.2% of the total annual State of Florida shoreline sea turtle nesting usage (Carr, 1976). The subject six shorelines make up approximately 60% of the total Pinellas County shoreline; therefore, the project area could be utilized for about 0.1% of the total State sea turtle nesting usage. According to information in the Carr report, this would amount to the usage of the project area by about 3.75 sea turtles per nesting season (June through August). The likelihood of this proposal significantly interfering with the unconfirmed 0.1% of the total State's annual sea turtle nesting cycle is very low. No protective action for sea turtle nesting appears necessary in relation to this project.

4. The project area is well within the summer range and close to a winter range (Tampa Bay) of the West Indian Manatee; however, the majority of the project activities will take place in waters unlikely to contain manatees (Gulf side of the islands). The project contract will be conditioned to restrict project-boat operations in the area to avoid injuring manatees. The brown pelican and bald eagle use the area for feeding, but no adverse impact on these species as a result of this project is anticipated. There is no critical habitat within the project area. (The Endangered Species Act of 1973 as amended, December 1978).

5. The above survey results leads to the conclusion of no effect on any listed threatened or endangered species.

Attachments: (a) Project Description
(b) Project Location Map

(a) PROJECT DESCRIPTION

(a) The western shores of four Pinellas County barrier-islands (Honeymoon Island, Clearwater Beach Island, Sand Key and Long Key) will receive initial restoration fills.

1. Honeymoon Island: Initial restoration along 5,000 feet of shoreline will require the discharge of 80,000 cy of material hydraulically dredged from Hurricane Pass. Federal Project maintenance dredging will provide 15,000 cy of beach nourishment material annually.

2. Clearwater Beach Island: Five thousand feet of the western shoreline will be restored with 100,000 cy of material dredged from shoal number one or from Federal Project maintenance dredging in Clearwater Pass. The same maintenance dredging will provide 10,000 cy of beach nourishment material annually.

3. Sand Key: Initial restoration of 10.2 miles of shoreline will be performed using 3,000,000 cy of material from shoal no. 1. Five year nourishment fills will require 300,000 cy of material to be supplied by Federal Project maintenance dredging in Johns Pass.

4. Long Key: Restoration of 2,500 feet of shoreline will require 100,000 cy of material from shoal no. 1 or Blind Pass. An offshore stone or sand breakwater is also being considered. Long Key was restored in 1979 when 143,000 cy of material from Blind Pass was discharged along 2,600 feet of shoreline, and 100,000 cy of material was used to form an offshore breakwater. The Pass-a-Grille groin will be rehabilitated in 1983. Annual nourishment fill will require 50,000 cy of material from Federal Project maintenance dredging in Blind Pass or from shoal no. 1.

(b) Two other barrier-islands (Treasure Island and Caladesi Island) will receive periodic nourishment fills.

1. Treasure Island: Initial restoration of 9,200 feet of shoreline was performed in 1969 by the discharge of 682,000 cy of dredged material obtained from an offshore borrow area and from Blind Pass. In 1971, the restoration fill area was extended for 2,000 feet with 75,000 cy of material obtained from the north end of the island. Nourishment fill was applied in 1972 with the discharge of 155,000 cy of material along the southern 2,000 feet of shoreline. In 1976, the southern 9,000 feet was nourished with 380,000 cy from an offshore borrow site, and groin no. 1 was completed. Construction of groin no. 2 was partially completed. In 1978, groin no. 2 was raised 2.5 feet with 50,000 cy of material from Blind Pass. In 1983, the groin at Blind Pass will be lengthened by 160 feet, and the southern 4,200 feet of shoreline will be nourished with 200,000 cy of material from Blind Pass. Approximately 50,000 cy of material from shoal no. 1 or Blind Pass will be needed annually to nourish the shoreline.

2. Caladesi Island: Approximately 10,000 cy of material from Hurricane Pass will be used annually for beach nourishment on an as needed basis.

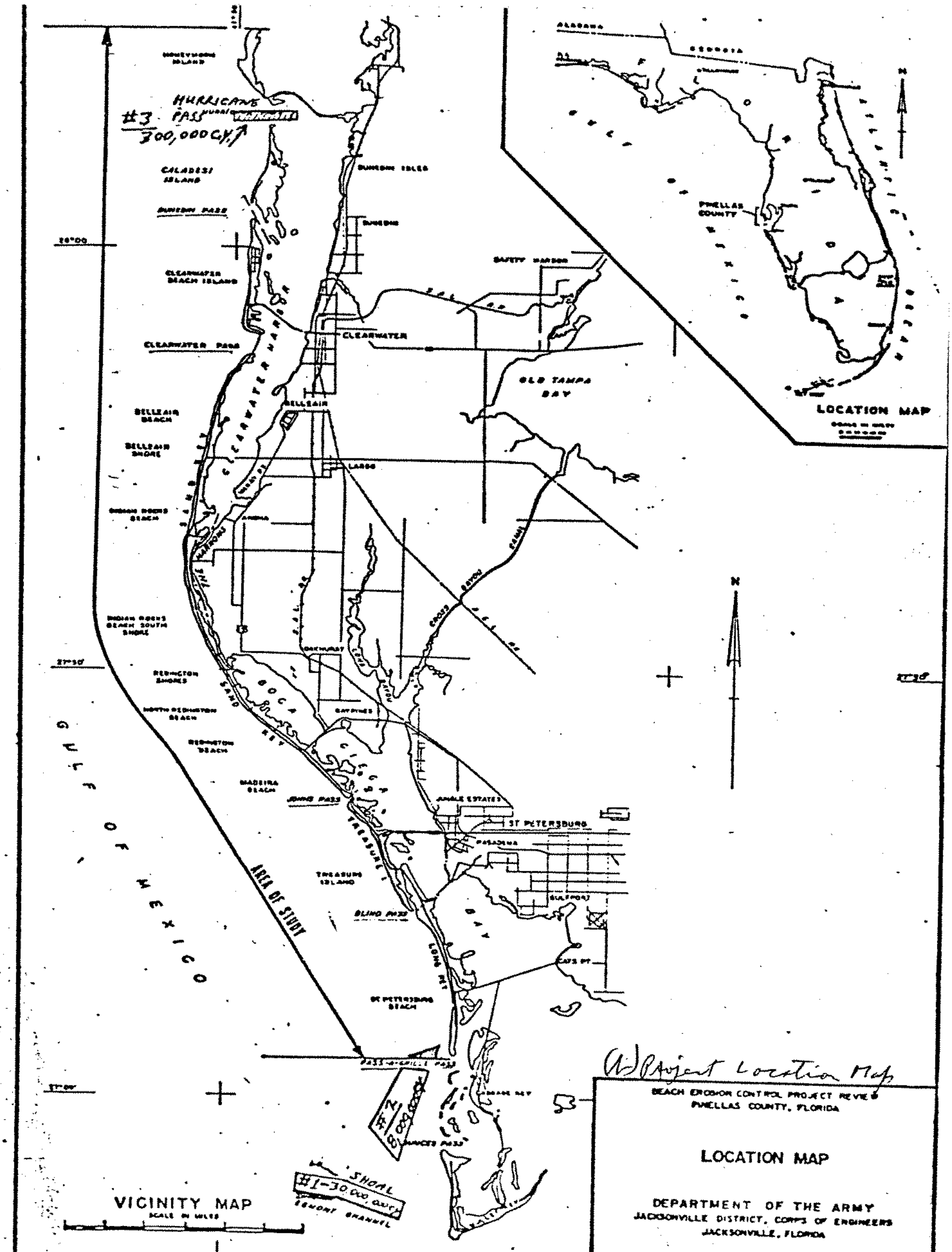

HONEYMOON ISLAND
HURRICANE PASS
#3 300,000 C.Y.
CALADESI ISLAND
DUNEDIN PASS
DUNEDIN ISLES
DUNEDIN
SAFETY HARBOR
CLEARWATER BEACH ISLAND
CLEARWATER PASS
CLEARWATER HARBOR
CLEARWATER
OLD TAMPA BAY
BELLEAIR
BELLEAIR BEACH
BELLEAIR SHORE
LARGO
INDIAN ROCKS BEACH
INDIAN ROCKS BEACH SOUTH SHORE
SAND KEY
REDINGTON SHORES
NORTH REDINGTON BEACH
REDINGTON BEACH
BOCA CIEGA BAY
MADEIRA BEACH
JOHNS PASS
TREASURE ISLAND
ST PETERSBURG
PASADENA
GULFPORT
BLIND PASS
LONG KEY
ST PETERSBURG BEACH
GULF OF MEXICO
AREA OF STUDY
PASS-A-GRILLE PASS
#2
BUNCES PASS
SHOAL
#1-30,000 C.Y.
EGMONT CHANNEL
VICINITY MAP
SCALE IN MILES
ALABAMA
GEORGIA
PINELLAS COUNTY
LOCATION MAP
(A) Project Location Map
BEACH EROSION CONTROL PROJECT REVIEW
PINELLAS COUNTY, FLORIDA
LOCATION MAP
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

FIGURE 1

P.O. Box 2676
Vero Beach, Florida 32960

February 6, 1980

District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32201

Dear Sir:

This letter represents a Fish and Wildlife Service planning-aid report concerning the review of the existing Federal Beach Erosion Control Project for Sand Key, Pinellas County, Florida. The Sand Key project is part of the Pinellas County Beach Erosion Control project authorized by Public Law 87-874, which was approved October 23, 1962 and presented in House Document No. 519, 89th Congress, 2nd Session. Our report is being submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and a funding agreement between the Service and the Corps of Engineers.

The purpose of the current study is to redetermine the need for, and feasibility of, providing measures to control beach erosion and prevent hurricane induced flooding along the Gulf shore of Sand Key.

Sand Key is a 13.9 mile long island located on the west coast of Florida between Clearwater and Treasure Islands. Johns Pass lies to the south and Clearwater Pass to the north. Sand Key is highly developed with private homes and resorts. The Gulf side contains numerous groins and fishing piers and some concrete seawalls.

The beach at Sand Key is experiencing erosion and recession of the shoreline, especially during severe storms. The Corps of Engineers plans to restore the eroded beach and, as necessary, to periodically nourish it to control further erosion.

During th[illegible] dives, they observed large sea whip "meadows" and many colorful sponges and tunicates encrusting the rock substate. Some of the sponges were as large as 2 feet across. Other invertebrates sighted in abundant numbers included starfish, sea urchins, and nudibranchs. Due to limited visibility they were only able to identify a few fish species. These included several species of wrass, sea robins, pigfish, and pinfish.

Approximately one mile offshore in 16 feet of water, the bottom appeared to be uniformly sand. At that depth and distance from shore, the water had sufficient clarity to allow observation from the surface through a glass plate. Live pen shell and very large lightning whelks were abundant.

The most common species occurring in the surf zone in decreasing order of abundance according to the Saloman study were scaled sardine, striped anchovy, tidewater silverside, Gulf kingfish, Atlantic threadfin herring, minkfish, Florida pompano, permit, and leatherjacket. Fish traps were used in the limestone outcropping area and silver perch, sand perch, sea catfish, pinfish, pigfish, grass porgy, southern sea bass, Atlantic spadefish and cobia were the most abundant species caught in the traps (in decreasing order of abundance).

During 1966, over 5 million pounds of finfish and 2.5 million pounds of shellfish were landed in Pinellas County by commercial fishermen (Anon. 1977). Many of these were caught in the area offshore of Sand Key. That area is also a popular sportfishing site, especially over the limestone outcroppings.

Several species of animals listed as endangered or threatened by the Fish and Wildlife Service may occur in the project's area of influence. These include the endangered bald eagle and brown pelican, the threatened loggerhead turtle and endangered Atlantic ridley turtle.

This project has the potential to interfere with, and could disturb marine turtle nesting if it is conducted during the turtle nesting season from May through mid-October. Bald eagles and brown pelicans are not likely to be affected by this project. Because Sand Key is presently highly developed, renourishment of the beach should have no long-term impact on the other wildlife species listed earlier. Should you determine that any of the threatened and endangered species would be affected by the work, you should initiate consultation in accordance with Section 7 of the amended Endangered Species Act of 1973.

Those benthic invertebrates which live in the intertidal and nearshore area which would receive fill would be destroyed, and the nearshore free-swimming organisms would leave the area during the period of increased turbidity. These impacts should be only temporary and those areas which were covered by fill should repopulate in a relatively short period.

Because most of the uplands of Sand Key have been subjected to urban development, there is limited usage of the island by wildlife except for shore and wading birds which utilize the beach zone. Certain animals which do fairly well in an urban environment may be found. These include the opossum, nine-banded armadillo, grey squirrel, black rat, raccoon, green anole, six-lined racerunner, southern five-lined skink, ground skink, green tree frog and eastern narrow-mouthed toad. Common passerines include grey kingbird, fish crow, Carolina wren, mocking bird, grey catbird, yellow-rumped warbler, and red-winged blackbird.

The abundant and common shore and wading birds which are found on the beach of Sand Key at least part of the year include the brown pelican, double-crested cormorant, great blue heron, great egret, snowy egret, Louisiana heron, black-crowned night heron, yellow-crowned night heron, semi-palmated plover, piping plover, Wilson's plover, black-bellied plover, ruddy turnstone, spotted sandpiper, willet, red knot, short-billed dowitcher, marbled godwit. semi-palmated sandpiper, sanderling, herring gull, ring-billed gull, laughing gull, Forster's tern, least tern, royal tern, sandwich tern, caspian tern and black skimmer.

The high energy, sandy beach of Sand Key is dominated by burrowing forms such as coquinas and mole crabs. These organisms are adapted to survive the scouring force of wave action by burrowing in the sand. Just off the surf-swept sandy beaches where benthic animals are partially protected from wave action during normal tides and surf conditions, whelks, olive shells, sun ray shells, starfish, and sand dollars are commonly found.

The high energy beach intergrades into the shallow shelf community. An extensive report by the National Marine Fisheries Service (Saloman 1974) found polychaete worms to be the most abundant single taxa within this community followed by nematodes, pelecypods, amphipods, and gastropods.

On December 13, 1979, biologists from this office conducted a brief survey of the nearshore shallow shelf using a Ross Depth Recorder and Scuba equipment. They restricted their random survey to the area between one quarter and one and one-half mile offshore based on information received from the Chief of your Coastal Engineering Section.

They attempted to dive on each benthic anomaly detected by the depth recorder to determine if any reef features were in the area. Near the center of Sand Key, approximately opposite the Narrows in 12 to 15 feet of water, they found what appeared to be low-relief rock outcroppings which extended north and south for at least 4 miles. The area seemed to correspond fairly well with the limestone outcroppings reported in the Saloman study.

If sand renourishment is obtained offshore from the project, the impact [illegible] be long term and severe. This would be especially true if the mat[illegible]l was taken from the area containing limestone outcroppings.

Saloman's study of three borrow pits dredged for fill offshore from Treasure Island found that the pits served as settling basins. He found that the accumulated sediments were high in silt and clays and organic material with low and critical oxygen values on the bottom from May through August. Over 10 feet of very soft, "jelly-like" sediments had accumulated in less than three years. Saloman concluded that abundance and diversity of benthic animals were low compared with natural undisturbed bottom in adjacent areas. Since this study terminated several years ago, the long-term effects have not been examined. However, based on the result of his study, we must assume that dredging offshore from Treasure Island caused a decrease in benthic animal life and consequently reduced fish and wildlife resources and water quality in the project area. We should assume that similar effects would occur off Sand Key if the area were dredged for fill without studies to prove otherwise. Dredging within the limestone outcropping zone would have an even greater impact because a benthic feature unique to the area would also be destroyed.

In light of the above discussion, the Fish and Wildlife Service offers the following recommendations which we believe would reduce the project's impact on fish and wildlife resources:

1. All work should be accomplished during the winter months between November and May to avoid impacting the turtle nesting season.

2. Before any dredging is conducted offshore from Sand Key, a follow-up study should be initiated to determine the present biotic and water quality conditions in the borrow pits excavated during the beach nourishment of Treasure Island. If the results of the study concur with Saloman's findings, i.e. low dissolved oxygen, reduced productivity, etc., then another source of sand, outside the marine environment, should be found. If, on the other hand, the results of the study indicate that the borrow areas have recovered and it is determined in the public interest to borrow sand from offshore, then the limestone outcroppings should be avoided in favor of a location farther offshore.

We appreciate the opportunity to provide this input into your planning process.

Sincerely yours,

Joseph D. Carroll, Jr.
Field Supervisor

att.
cc:
AO, Jacksonville, Fla.
[illegible]
[illegible]

Literature Cited

Saloman, C. H. 1974. Physical, chemical, and biological characteristics of nearshore zone of Sand Key, Florida, prior to beach restoration. NMFS Rep. to U.S. Army Corps of Engineers under Interservice Support Agreement NO. CERC 73-27.

Anon. 1978. Current Fisheries Statistics No. 7219, Florida Landings Annual Summary 1976. U.S. Dept. of Commerce, NOAA-NMFS.

August 27, 1980

Mr. James L. Garland
Chief, Engineering Division
Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32201

Log No. 4-1-80-I-237

Dear Mr. Garland:

This is in response to your letter of July 30, 1980 regarding the proposed beach nourishment project for Sand Key in Pinellas County, Florida. The project entails restoring 10.1 miles of beach on Sand Key by placing approximately 2.9 million cubic yards of material obtained from an offshore borrow area. It is understood that periodic nourishment will be undertaken as required. Grain size, sorting value, and silt content studies revealed that the borrow area material is compatible with the existing beach material.

As indicated in your letter, if the nourishment project cannot be scheduled during the non-turtle nesting period (November through April) then a private contractor registered and properly permitted by the Florida Department of Natural Resources, will be hired to patrol the beach on a daily basis and relocate eggs. We request that any reports that are submitted by the contractor regarding the relocation program be forwarded to our office. In addition, may we suggest that a report summarizing the percent hatching success of the relocated eggs be prepared by the contractor, and also forwarded to our office.

With regards to the manatee, we understand that the following precautions will be taken to protect this species. As brought out in your letter, manatees may be present in Boca Ciega Bay and Clearwater Harbor.

The contractor will instruct all personnel associated with the project about the presence of manatees in the area and the need to avoid collisions with manatees. All vessels associated with the project shall operate at "no wake" speeds at all times while in shallow waters or channels where the draft of the boat provides less than 3 feet clearance of the bottom.

Vessels transporting personnel between the landing and the dredge shall follow routes of deep water to the extent possible. All personnel should be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Endangered Species Act of 1973, as amended, the Marine Mammal Protection Act of 1972, and Section 370.12, Florida Statutes. The contractor shall be held responsible for any manatee harmed, harassed, or killed as a result of the construction of the project.

The contractor shall keep a log detailing all sightings, injuries, or killings of manatees which have occurred during the contract period. Any collision with a manatee resulting in death or injury to the animal shall be reported immediately to the Chief, Environment and Resources Branch (Jacksonville District), and the U.S. Fish and Wildlife Service (Jacksonville Area Office). Following project completion, a report summarizing the above incidents shall be submitted to the Chief, Environment and Resources Branch. We also request that a copy of this report be forwarded to our office.

This does not constitute a Biological Opinion as described in Section 7 of the Endangered Species Act; however, it does fulfill the requirements of the Act and no further action on your part is required. If modifications are made in the project or if additional facts involving potential impacts on listed species arise, consultation should be reinitiated.

Sincerely yours,

/s/

Donald J. Hankla
Area Manager

cc:
Regional Director, Atlanta (SE)
ES, Vero Beach
Director, FWS, Washington (SE)
NMFS, (Carol Justice)
Pat Rose, Manatee Coordinator, Maitland, FL

DPALMER: jg 8/27/80

Ronnie's Copy

SAJPD-ES

24 ~~12~~ May 1983

Mr. David W. Peterson
U.S. Fish and Wildlife Service
2747 Art Museum Drive
Jacksonville, Florida 32207

Dear Mr. Peterson:

The Biological Assessment addressing the probable effects of the proposed Pinellas County Beach Erosion project on the listed species named in your letter (copy attached) of 6 February 1981 is inclosed. Coordination under Section 7 of the Endangered Species Act was completed for the Sand Key portion of this project (Log No. 4-1-80-I-237) by your letter dated 27 August 1980 (copy attached).

The Corps has concluded the proposed action will not affect any listed species. This completes coordination under the Endangered Species Act unless new information should indicate the proposed action may affect listed species or their habitats, or the proposed action is substantively modified, or a new species is listed that may be affected by the action, or you request consultation.

Sincerely,

3 Incl
As stated

A. J. SALEM
Chief, Planning Division

SAJPD-ES

24 May 1983

BIOLOGICAL ASSESSMENT
THREATENED AND ENDANGERED SPECIES CONSIDERATIONS
BEACH RESTORATION AND EROSION CONTROL PROJECT
GULF COAST OF PINELLAS COUNTY, FLORIDA

1. The proposed project (see attachments) is to restore the western shorelines of four barrier islands and to periodically discharge nourishment fills on those four islands and two other barrier islands. The subject islands are Sand Key, Treasure Island, Clearwater Beach Island, Long Key, Honeymoon Island, and Caladesi Island. Breakwaters and/or groins are being considered for use to stabilize the fills. Hydraulically dredged material from two off-shore shoals and material obtained from Federal Project maintenance dredging in passes between some of the project islands will supply the fill materials for this project.

2. Study methods included literature review. The needed data was obtained without difficulty.

3. The Pinellas County shores are believed but not documented, to be used for sea turtle nesting at a frequency of 0.2% of the total annual State of Florida shoreline sea turtle nesting usage (Carr, 1976). The subject six shorelines make up approximately 60% of the total Pinellas County shoreline; therefore, the project area could be utilized for about 0.1% of the total State sea turtle nesting usage. According to information in the Carr report, this would amount to the usage of the project area by about 3.75 sea turtles per nesting season (June through August). The likelihood of this proposal significantly interfering with the unconfirmed 0.1% of the total State's annual sea turtle nesting cycle is very low. No protective action for sea turtle nesting appears necessary in relation to this project.

4. The project area is well within the summer range and close to a winter range (Tampa Bay) of the West Indian Manatee; however, the majority of the project activities will take place in waters unlikely to contain manatees (Gulf side of the islands). The project contract will be conditioned to restrict project-boat operations in the area to avoid injuring manatees. The brown pelican and bald eagle use the area for feeding, but no adverse impact on these species as a result of this project is anticipated. There is no critical habitat within the project area. (The Endangered Species Act of 1973 as amended, December 1978).

5. The above survey results leads to the conclusion of no effect on any listed threatened or endangered species.

Attachments: (a) Project Description
(b) Project Location Map

(a) PROJECT DESCRIPTION

(a) The western shores of four Pinellas County barrier-islands (Honeymoon Island, Clearwater Beach Island, Sand Key and Long Key) will receive initial restoration fills.

1. Honeymoon Island: Initial restoration along 5,000 feet of shoreline will require the discharge of 80,000 cy of material hydraulically dredged from Hurricane Pass. Federal Project maintenance dredging will provide 15,000 cy of beach nourishment material annually.

2. Clearwater Beach Island: Five thousand feet of the western shoreline will be restored with 100,000 cy of material dredged from shoal number one or from Federal Project maintenance dredging in Clearwater Pass. The same maintenance dredging will provide 10,000 cy of beach nourishment material annually.

3. Sand Key: Initial restoration of 10.2 miles of shoreline will be performed using 3,000,000 cy of material from shoal no. 1. Five year nourishment fills will require 300,000 cy of material to be supplied by Federal Project maintenance dredging in Johns Pass.

4. Long Key: Restoration of 2,500 feet of shoreline will require 100,000 cy of material from shoal no. 1 or Blind Pass. An offshore stone or sand breakwater is also being considered. Long Key was restored in 1979 when 143,000 cy of material from Blind Pass was discharged along 2,600 feet of shoreline, and 100,000 cy of material was used to form an offshore breakwater. The Pass-a-Grille groin will be rehabilitated in 1983. Annual nourishment fill will require 50,000 cy of material from Federal Project maintenance dredging in Blind Pass or from shoal no. 1.

(b) Two other barrier-islands (Treasure Island and Caladesi Island) will receive periodic nourishment fills.

1. Treasure Island: Initial restoration of 9,200 feet of shoreline was performed in 1969 by the discharge of 682,000 cy of dredged material obtained from an offshore borrow area and from Blind Pass. In 1971, the restoration fill area was extended for 2,000 feet with 75,000 cy of material obtained from the north end of the island. Nourishment fill was applied in 1972 with the discharge of 155,000 cy of material along the southern 2,000 feet of shoreline. In 1976, the southern 9,000 feet was nourished with 380,000 cy from an offshore borrow site, and groin no. 1 was completed. Construction of groin no. 2 was partially completed. In 1978, groin no. 2 was raised 2.5 feet with 50,000 cy of material from Blind Pass. In 1983, the groin at Blind Pass will be lengthened by 160 feet, and the southern 4,200 feet of shoreline will be nourished with 200,000 cy of material from Blind Pass. Approximately 50,000 cy of material from shoal no. 1 or Blind Pass will be needed annually to nourish the shoreline.

2. Caladesi Island: Approximately 10,000 cy of material from Hurricane Pass will be used annually for beach nourishment on an as needed basis.

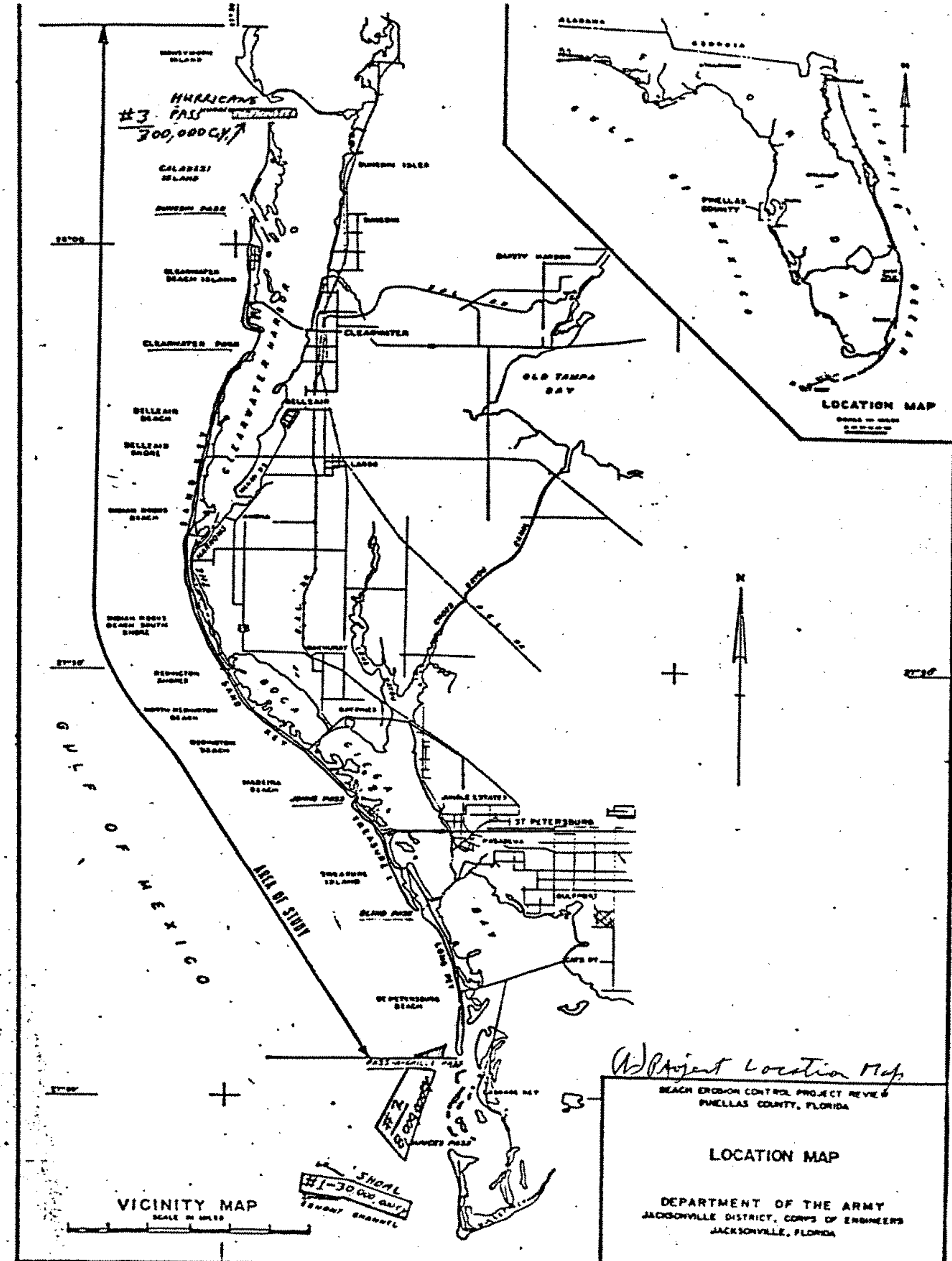

#3 HURRICANE PASS
300,000 C.Y.
CLEARWATER
CLEARWATER HARBOR
OLD TAMPA BAY
BOCA CIEGA BAY
ST PETERSBURG
GULF OF MEXICO
AREA OF STUDY
SHOAL
#1-30,000 C.Y.
VICINITY MAP
LOCATION MAP
(A) Project Location Map
BEACH EROSION CONTROL PROJECT REVIEW
PINELLAS COUNTY, FLORIDA
LOCATION MAP
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA

FIGURE 1

March 29, 1984

Environmental Resources Branch
Planning Division

[illegible]

Dear Mr. Carroll:

This is to respond to your letter, dated January 26, 1984, on the Pinellas County Beach Erosion Control study's relation to the Coastal Barrier Resources Act (CBRA). The Corps agrees with your statement that this study's selected plan would not impact the CBR system units in Pinellas County. Nonstructural work (beach nourishment) would be performed at least 3,600 feet to the south (on Clearwater Beach Island) and at least 1,500 feet to the north (on Caladesi Island) of unit P-24A if the selected plan is implemented. No work would be performed in the immediate vicinity of unit 24.

Since consultation is required only when a Federal agency proposes to make Federal expenditures or financial assistance available within a CBR system unit as authorized by Section 6 of the CBRA (Exceptions), CBRA consultation for this study's selected plan would not be required. This concludes the informal coordination under CBRA for this study.

Sincerely,

[illegible]
[illegible] Division

August 27, 1980

Mr. James L. Garland
Chief, Engineering Division
Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32201

Log No. 4-1-80-I-237

Dear Mr. Garland:

This is in response to your letter of July 30, 1980 regarding the proposed beach nourishment project for Sand Key in Pinellas County, Florida. The project entails restoring 10.1 miles of beach on Sand Key by placing approximately 2.9 million cubic yards of material obtained from an offshore borrow area. It is understood that periodic nourishment will be undertaken as required. Grain size, sorting value, and silt content studies revealed that the borrow area material is compatible with the existing beach material.

As indicated in your letter, if the nourishment project cannot be scheduled during the non-turtle nesting period (November through April) then a private contractor registered and properly permitted by the Florida Department of Natural Resources, will be hired to patrol the beach on a daily basis and relocate eggs. We request that any reports that are submitted by the contractor regarding the relocation program be forwarded to our office. In addition, may we suggest that a report summarizing the percent hatching success of the relocated eggs be prepared by the contractor, and also forwarded to our office.

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The contractor shall keep a log detailing all sightings, injuries, or killings of manatees which have occurred during the contract period. Any collision with a manatee resulting in death or injury to the animal shall be reported immediately to the Chief, Environment and Resources Branch (Jacksonville District), and the U.S. Fish and Wildlife Service (Jacksonville Area Office). Following project completion, a report summarizing the above incidents shall be submitted to the Chief, Environment and Resources Branch. We also request that a copy of this report be forwarded to our office.

This does not constitute a Biological Opinion as described in Section 7 of the Endangered Species Act; however, it does fulfill the requirements of the Act and no further action on your part is required. If modifications are made in the project or if additional facts involving potential impacts on listed species arise, consultation should be reinitiated.

Sincerely yours,

/s/

Donald J. Hankla
Area Manager

cc:
Regional Director, Atlanta (SE)
ES, Vero Beach
Director, FWS, Washington (SE)
NMFS, (Carol Justice)
Pat Rose, Manatee Coordinator, Maitland, FL

DPALMER: jg 8/27/80

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30365

DEC 22 1982

4PM-EA/WET

Mr. A. J. Salem
Acting Chief, Planning Division
U. S. Army Corps of Engineers
P. O. Box 4970
Jacksonville, Florida 32232

SUBJECT: Beach Erosion Control Project
Pinellas County, Florida
(SAJPD-ES)

Dear Mr. Salem:

This is in response to your request of November 24, 1982, for EPA's views on significant issues which should be analyzed and alternative measures which should be considered in the preparation of the Draft EIS for the Pinellas County Beach Erosion Control Project.

We have already made recommendations on borrow sites and measures of controlling erosion in previous correspondence covering each of the individual beaches comprising the system. In many cases it has been possible to combine authorized channel maintenance and improvements with beach nourishment. Where this can be done, and the dredging is less frequent, there is a reduction in the loss of marine biota, water quality impacts are less, and there is a possibility that costs can be prorated with a resultant benefit to both the navigation and beach nourishment projects. We believe this procedure should be given prime consideration as the perferred alternative on most beach nourishment projects.

For instance, the North Shore Parks beaches in Pinellas County can be fully maintained by using materials from the St. Petersburg Harbor entrance channel and Section 3 of the Tampa Harbor channel. Material from Blind Pass can be used in the beaches at Treasure Island or on the beaches south of the pass. Materials from Johns Pass can also be used at Treasure Island.

Materials from Longboat Pass can be used on the County Park beach north of the pass or on Longboat Key beach south of the pass. However, at Treasure Island and a few of the other beaches, insufficient materials have been available in the passes to supply all renourishment needs. Particularly at Treasure Island, where the beaches have been renourished at least four times in the past twelve years, the benefit to cost ratio should be closely scrutinized.

Because of the gradual rise of the water level along the Atlantic and Gulf coast and the resultant persistent erosion, beach nourishment is presently viewed by many scientists and agencies as a questionable and costly stopgap measure with no permanent solution to the problem. This is particularly true where the project cannot be combined with an authorized navigation project and the site has a history of persistent erosion.

In order that we may properly review and evaluate the environmental impacts of the various beach erosion control projects, we believe the EIS should include, but should not necessarily be limited to the following:

(1) A thorough discussion of the possibility of combining the beach nourishment project with the maintenance of, and/or improvements to, authorized navigation projects.

(2) A thorough evaluation of the economics of the project particularly where several renourishments of the beach have already taken place.

(3) Identification of the biotic communities present at both the borrow sites and beach disposal sites and offshore areas with special emphasis on grass flats, bird and turtle nesting habitat, productive estuarine areas, marsh and wetlands and the impact on these resources.

(4) Physical characteristics of the materials being dredged. Also chemical constituents of the material if they are obtained from inland harbor areas or other areas where the material has a possibility of being contaminated.

(5) Impact of any proposed structures such as groins, sedimentation basins, seawalls, jetties, etc. on hydrology, current patterns, sedimentation, and/or erosion on the beach being protected and adjacent beaches.

(6) Where offshore borrow areas must be used they are frequently questionable because they leave sinks with low DO and low productivity. Where they are located close to shore they tend to increase beach erosion or damage productive shallow water areas. They are also dangerous to swimmers. Where selected as an alternative to obtaining the materials from an authorized navigation channel, they should be done on a site specific basis with proper biological and hydrological surveys of the site and should be covered with a 404(b) evaluation in the EIS.

If additional information is needed, kindly contact this office.

Sincerely yours,

Sheppard N. Moore

Sheppard N. Moore, Chief
Environmental Review Section
Environmental Assessment Branch

cc: See attached

cc: Ms. Victoria J. Tschinkel, Secretary
Florida Department of Environmental Regulation

Mr. Joe Carroll, Field Supervisor
U.S. Fish and Wildlife Service
Vero Beach, Florida

Dr. Edward Keppner, Field Supervisor
National Marine Fisheries Service
Panama City, Florida

Mr. J. T. Brawner, Regional Director
National Marine Fisheries Service
St. Petersburg, Florida

United States Department of the Interior
FISH AND WILDLIFE SERVICE
P.O. Box 2676
Vero Beach, Florida 32960

January 31, 1983

District Engineer
U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, Florida 32232

Dear Sir:

This is in response to a letter dated November 24, 1982, SAJPD-ES, from your Acting Chief, Planning Division, requesting our comments on your proposal to prepare an Environmental Impact Statement (EIS) for the beach erosion control project for Pinellas County, Florida. Our comments are provided in accordance with provision of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

This Service has submitted various reports on segments of this project. In a report dated April 22, 1982 concerning Treasure Island, where the borrow area was a sand shoal in Blind Pass, we anticipated no significant adverse impacts to fish and wildlife resources. Because of sea turtle nesting (an endangered species) along these beaches, recommendations were made to avoid impacting the beaches during the nesting season or to implement an egg transplanting program. We also submitted a report on Sand Key dated February 6, 1980. In that report, we expressed our concern that the borrow area construction could adversely impact limestone outcroppings that were acting as a reef offshore in 12-15 feet of water. We also discussed the problem of the poor habitat provided by the deep borrow pits that were dredged for beach nourishment fill off Treasure Island.

It is our understanding that tentative plans for beach nourishment include the possibility of using a Sauerman Drag-Scraper and a series of offshore breakwaters. Although this Service has not had the opportunity to make an onsite inspection of this area, we are concerned that seagrass and rock outcroppings could be adversely impacted by these activities. The location of these biological resources should be identified and plans formulated to avoid impacting them. The Fish and Wildlife Service in the near future plans to conduct a survey of this area to evaluate fish and wildlife resources that could be impacted under this plan.

From a biological view, the most favorable source of sand for beach nourishment would be shoal areas in or around passes. Next would be near inshore areas in close proximity to the shoreline such as proposed by the Sauerman Drag-Scraper. These borrow areas would be expected to refill rapidly. The least favorable potential borrow area because of long-term adverse impact would be dredging sand from offshore borrow areas. These borrow areas if made deep reduce the diversity and density of the benthic community. These various sources of obtaining fill material should be addressed in the alternative analysis of your report.

Because of known offshore rock outcropping serving as reefs with attached coral (sea whips), beach nourishment along Sand Key should be planned so as to keep turbidity discharges to offshore waters to a minimum.

Thank you for the opportunity to comment at this time. We look forward to further planning input by reviewing your plans as they develop for this project.

Sincerely yours,

Joseph D. Carroll, Jr.
Field Supervisor

cc:
RO, Atlanta, Ga.

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232

SAJPD-ES

24 November 1982

TO ADDRESSEES LISTED:

The Corps of Engineers is preparing a Program Environmental Impact Statement (EIS) on beach erosion control measures for part of the Gulf of Mexico shore of Pinellas County, Florida. Public Law 89-789, passed 7 November 1966, authorizes the Pinellas County beach erosion control project described in House Document No. 519, 89th Congress, 2nd Session. Authorized are:

a. Restoration of 5,000 feet of beach at Clearwater Beach Island;

b. Restoration of 49,000 feet of beach at Sand Key;

c. Restoration of 9,200 feet of beach at Treasure Island;

d. Construction of 600 feet of revetment at Long Key; and

e. Advance nourishment of 5,600 feet of Long Key, and periodic nourishment of each island, as needed. The local sponsor is the Board of County Commissioners, Pinellas County, Florida.

Senate Public Works Committee Resolution adopted 4 March 1976 and House Public Works Committee Resolution adopted 23 September 1976 authorized a review of the beach erosion control report on Pinellas County, Florida, with particular reference to the advisability of extending the period of Federal participation for project beach renourishment. Honeymoon and Caladesi Islands were added to the project review study at the request of the Florida Department of Natural Resources during the initial public meeting held at Clearwater, Florida, on 30 March 1978.

As part of the planning process the Corps is soliciting public and agency views on significant issues to be analyzed in depth in the draft EIS and alternative measures that should be considered. Issues to be discussed in the EIS will include but not be limited to: a) location of areas to be nourished; b) sources of sand or other suitable beach nourishment materials; c) impacts of the proposed nourishment on significant biological, cultural, or archeological resources; and d) alternative measures to protect the Pinellas County shore.

SAJPD-ES
To Addressees Listed

Please submit your views and comments on issues which should be addressed during EIS preparation to the undersigned by 29 December 1982. Questions may be directed to the letterhead address, ATTN: SAJPD-ES.

Sincerely,

A. J. Salem

A. J. SALEM
Acting Chief
Planning Division

MASTER

PD-ES

LIST OF ADDRESSEES

NATIONAL

Director
Office of Federal Activities (A-104)
Environmental Protection Agency
401 M Street SW
Washington, DC 20460 (5 cys)

Ms. Joyce M. Wood, Director
Office of Ecology & Conservation
Department of Commerce - Room 5813 (PP/EC)
14th and Constitution Ave., NW
Washington, DC 20230 (4 cys)

Mr. Robert Stern
Division of NEPA Affairs
Department of Energy, Room 4G064
1000 Independence Ave., SW
Washington, DC 20585 (10 cys)

Mr. Edward R. Meyer
Federal Maritime Commission
Office of Energy & Environmental Impact
1100 L Street, NW
Washington, DC 20573

Mr. Charles Custard
Department of Health & Human Services
Room 537F Humphrey Building
200 Independence Ave., SW
Washington, DC 20201 (2 cys)

Mr. John Seyffert
Federal Energy Management Administration
Room 713
500 C Street, SW
Washington, DC 20472

Mr. Bruce Blanchard, Director
Office of Environmental Project Review
Department of the Interior, Room 424-1
18th and C Streets, NW
Washington, DC 20240 (12 cys)

Executive Director
Advisory Council on Historic
Preservation
1522 K Street NW
Washington, DC 20005

MASTER

PD-ES

LIST OF ADDRESSEES

FLORIDA

State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
P.O. Box 1208
Gainesville, Florida 32601

State Director
Agriculture Stabilization and
Conservation Service
U.S. Department of Agriculture
P.O. Drawer 670
Gainesville, FL 32602

Mr. Henry Walls
Regional Environmental Officer
Department of Housing & Urban
Development
75 Spring Street, SW, Room 576
Atlanta, GA 30303 (2 cys)

Regional Forester
Southern Region
U.S. Forest Service
Department of Agriculture
1720 Peachtree Road NW
Atlanta, Georgia 30309

Division Engineer
Federal Highway Administration
P.O. Box 1079
Tallahassee, Florida 32302 (2 cys)

National Marine Fisheries Service
Environmental Assessment Branch
3500 Delwood Beach Road
Panama City, Florida 32407

Seventh Coast Guard District (dpl)
51 SW 1st Avenue
Miami, Florida 33130

National Marine Fisheries Service
Office of the Regional Director
9450 Koger Boulevard
St. Petersburg, Florida 33702

Mr. Sheppard N. Moore
Environmental Review Section
Environmental Protection Agency
Region IV
345 Courtland Street NE
Atlanta, Georgia 30365 (5 cys)

Director
Office of Federal Activities (A-104)
Environmental Protection Agency
401 M Street SW
Washington, DC 20460 (5 cys)

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Insurance & Mitigation Division
Federal Emergency Management
Administration
1371 Peachtree Street NE
Atlanta, Georgia 30309

Regional Director
U.S. Fish and Wildlife Service
75 Spring Street, SW
Atlanta, Georgia 30303

MASTER

PD-ES

LIST OF ADDRESSEES

FLORIDA

The Nature Conservancy
Florida State Office
1350 Orange Ave., Suite 224
Winter Park, FL 32789

Office of the Regional Representative
Department of Energy
1655 Peachtree Street NE
Atlanta, Georgia 30309

Chief, Environmental Affairs Group
Environmental Health Services Div.
Center for Disease Control
Department of Health and
Human Services
Atlanta, Georgia 30333 (2 cys)

Mr. Brian Paradise, Chairman
Sierra Club
9252 San Jose Boulevard, No. 1902
Jacksonville, Florida 32217

Florida Audubon Society
1101 Audubon Way
Maitland, Florida 32751

Mr. John Rains, Jr.
Isaak Walton League of America, Inc.
5314 Bay State Road
Palmetto, Florida 33561

Field Supervisor
U.S. Fish and Wildlife Service
P.O. Box 2676
Vero Beach, Florida 32960

State Planning & Development
Clearinghouse
Office of Planning & Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32301 (16 cys)

Florida Natural Areas Inventory
The Nature Conservancy
254 East Sixth Avenue
Tallahassee, Florida 32303

Mr. Jim Baker
Van Wagenen and Searcy
1730 Shadowood Lane
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Field Supervisor
Jacksonville Endangered Species Field Office
U.S. Fish and Wildlife Service
15 North Laura Street
Jacksonville, Florida 32202

National Audubon Society
Southeast Regional Office
P.O. Box 1268
Charleston, South Carolina 29402

National Audubon Society
P.O. Box 1156
Bradenton, Florida 33505

Dr. Jorge R. Rey
Florida Medical Entomology Laboratory
Institute of Food and Agricultural
Sciences
University of Florida
P.O. Box 520
Vero Beach, Florida 32961

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Region
9450 Koger Boulevard
St. Petersburg, FL 33702

August 24, 1982

F/SER613/SBD
904-234-5061

Colonel Alfred B. Devereaux, Jr.
District Engineer, Jacksonville District
Department of the Army, Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32201

Dear Colonel Devereaux:

This is in response to the July 27, 1982 letter to us from Mr. Stanley M. Rosen, Acting Chief, Planning Division, regarding alternative flood control and shoreline erosion control measures for the gulf coast shoreline of Pinellas County, Florida.

Based on the information provided, we are concerned about potential adverse impacts to fishery resources, especially benthic communities, in the borrow areas which may result from the use of the "drag-scraper". We would be interested in reviewing any benthic studies you may have associated with the drag-scraper mining operations and resultant borrow pits. Regarding the breakwater alternative. we request an opportunity to review more specific plans when they become available.

Please keep us apprised of all flood control and shoreline erosion control alternatives and associated detailed project plans for the gulf coast shoreline of Pinellas County as they are developed.

Thank you for the opportunity to provide these comments.

Sincerely yours,

Edwin J. Keppner

for Richard J. Hoogland
Chief, Environmental Assessment Branch

Notice of Final Public Meeting

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232

Planning Division
Coastal Branch

NOTICE OF PUBLIC HEARING

TO WHOM IT MAY CONCERN: This District is sponsoring a public hearing concerning the review study on Beach Erosion Control at Pinellas County, Florida.

TIME AND PLACE: To be held on May 17, 1984 at 7:00 p.m. at the Pinellas County Courthouse, Board of County Commissioners, Assembly Room (5th Floor), 315 Court Street, Clearwater, Florida.

DESCRIPTION OF STUDY: The draft review study report on Beach Erosion Control at Pinellas County found that initial and continued nourishment of the project shores is the most feasible method of erosion control. The recommended plan provides for initial nourishment of Honeymoon Island, Clearwater Beach Island, and Sand Key with continued nourishment of Long Key and Treasure Island. Periodic nourishment of all shores including Caladesi Island is also recommended. Total first cost of project construction is $27,988,000. The estimated Federal share is $14,169,000. Pinellas County is acting as the local sponsor. Location of the proposed nourishment is shown on the attached figure.

NOTE: Questions concerning this public meeting should be directed to the letterhead address, or by telephone to Juan A. Colon at (904) 791-2235.

This is NOT a circular.

IMPORTANT

PENALTY FOR PRIVATE USE, $300
OFFICIAL BUSINESS

JACKSONVILLE, FLORIDA 32232
P. O. Box 4970
U. S. ARMY ENGINEER DISTRICT, JACKSONVILLE
DEPARTMENT OF THE ARMY

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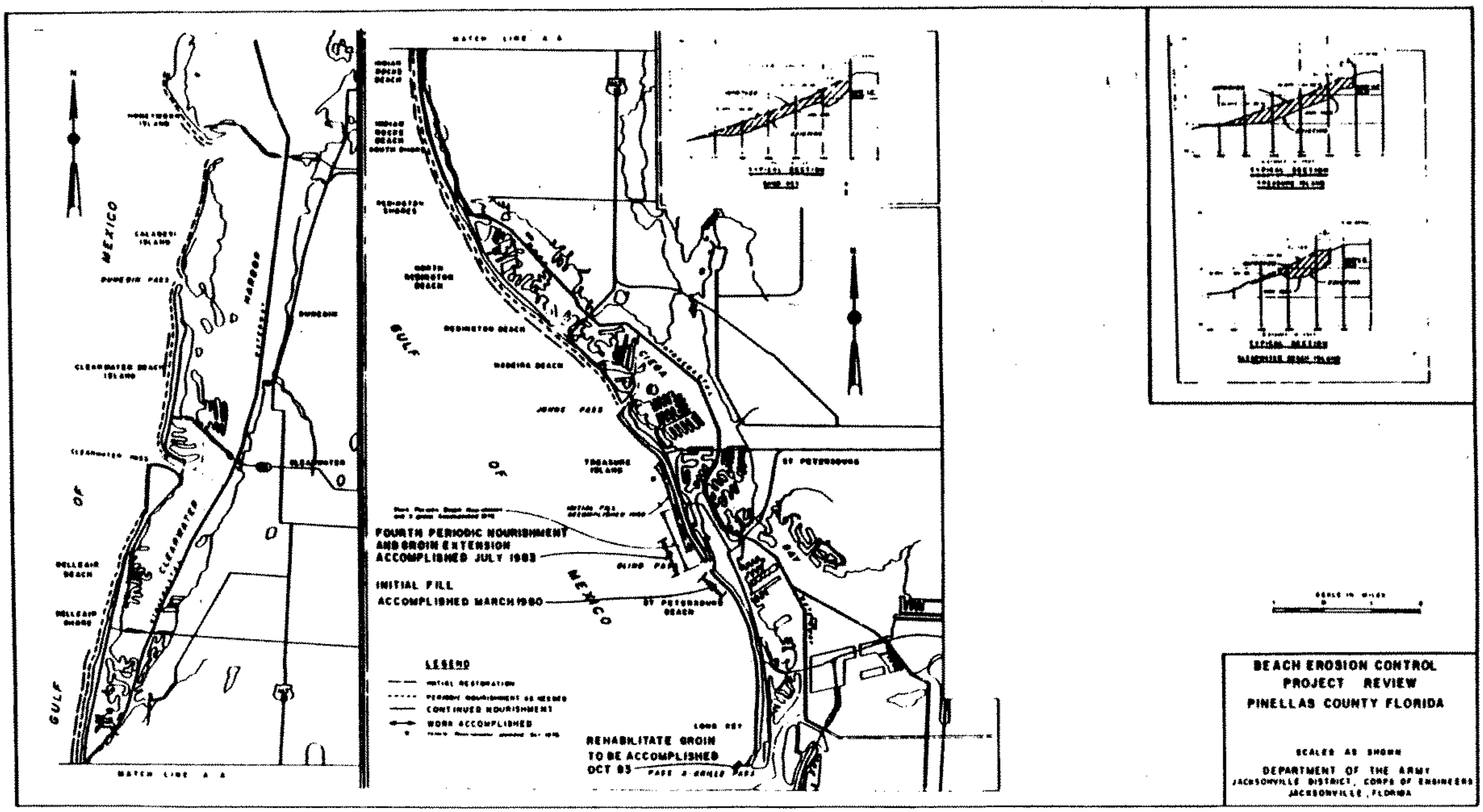
BEACH EROSION CONTROL
PROJECT REVIEW
PINELLAS COUNTY FLORIDA
SCALES AS SHOWN
DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
JACKSONVILLE, FLORIDA
FOURTH PERIODIC NOURISHMENT
AND GROIN EXTENSION
ACCOMPLISHED JULY 1983
INITIAL FILL
ACCOMPLISHED MARCH 1980
REHABILITATE GROIN
TO BE ACCOMPLISHED
OCT 93
LEGEND
INITIAL RESTORATION
CONTINUED NOURISHMENT
WORK ACCOMPLISHED
GULF OF MEXICO
CLEARWATER
ST PETERSBURG
ST PETERSBURG BEACH
TREASURE ISLAND
MADEIRA BEACH
REDINGTON BEACH
NORTH REDINGTON BEACH
REDINGTON SHORES
BELLEAIR BEACH
BELLEAIR SHORE
CLEARWATER BEACH ISLAND
CALADESI ISLAND
HONEYMOON ISLAND
DUNEDIN
DUNEDIN PASS
CLEARWATER PASS
JOHNS PASS
BLIND PASS
PASS A GRILLE PASS
LONG KEY
BOCA CIEGA
BAY
MATCH LINE A A
TYPICAL SECTION

Hod

BOARD OF COUNTY COMMISSIONERS
PINELLAS COUNTY, FLORIDA
DEPARTMENT OF PUBLIC WORKS AND UTILITIES
ENGINEERING · OPERATIONS · SOLID WASTE · WATER · SEWER
315 COURT STREET
CLEARWATER, FLORIDA 33516
Phone: (813) 462-3251

May 21, 1984

Mr. Andy Hobbs
Planning Division
U. S. Army Corps of Engineers
Jacksonville District
P. O. Box 4970
Jacksonville, Florida 32201

Re: Beach Erosion Project Control Review Study and Environmental Impact Study for Pinellas County, Florida; Public Hearing May 17, 1984

Dear Andy:

Please find enclosed a list of those news agencies to which a notice of public hearing for the above referenced project was sent. In addition to these listed, a notice was also sent to the Municipalities of Madeira Beach, Redington Beach, North Redington Beach, Redington Shores, Indian Shores, Belleair Shores, Belleair Beach, Indian Rocks Beach, along with the City of Clearwater.

Please advise if I can be of further assistance.

Sincerely,

J. Terry

James B. Terry
Engineering Services

JBT:bh

Enclosure

ABQ 086840	F		MEDIA MAILING LIST	BCR-ABQ	CLEM OR KAREN	EXT 3807
ABQ 086850	F	33601	ROD CHALLENGER	WXFL-TV CHANNEL 8	P O BOX 1410	TAMPA, FL
ABQ 086855	F	33520	NEIL VICINO	WXFL-TV CHANNEL 8	3696 ULMERTON RD	CLEARWATER, FL
ABQ 086860	F	33518	NEWS ASSIGNMENT EDITOR	WCLF-TV CHANNEL 22	P O BOX 6922	CLEARWATER, FL
ABQ 086870	F	33733	CRAIG ROBERTS	WTSP-TV CHANNEL 10	P O BOX 10000	ST PETERSBURG, FL
ABQ 086880	F	33515	JOHN DI QUARTO	PROGRAM DIRECTOR	VISION CABLE	2530 DREW ST CLEARWATER, FL
ABQ 086885	F	33565	BILLIE NOAKES	PUBLIC AFFAIRS COORD.	VISION CABLE	7901 66TH ST N PINELLAS PARK, FL
ABQ 086890	F	33622	ROY BLUSH	WTVT CHANNEL 13	P O BOX 22013	TAMPA, FL
ABQ 086900	F	33516	GAIL NEWMAN	CENTEL CABLE TV	309 S GARDEN AVE	CLEARWATER, FL
ABQ 086910	F	33742	CHRIS ABEL	WTOG-TV CHANNEL 44	P O BOX 20144	ST PETERSBURG, FL
ABQ 086920	F	33620	KRISTI KELLER	WUSF-TV CHANNEL 16	UNIV. OF SOUTH FLORIDA	TAMPA, FL
ABQ 086930	F	33581	NEWS ASSIGNMENT EDITOR	WXLT CHANNEL 40	5725 LAWTON DR	SARASOTA, FL
ABQ 086940	F	33607	NEWS ASSIGNMENT EDITOR	WEDU-TV CHANNEL 3	1300 N BLVD	TAMPA, FL
ABQ 086945	F	33630	ANDREA MCDANIEL	WFTS-TV CHANNEL 28	P O BOX 30028	TAMPA, FL
ABQ 086965	F	33515	SHERI SOUTHMADE	WMGG-FM	51 S MAIN AVE STE 96	CLEARWATER, FL
ABQ 086970	F	33609	DREW VOGEL	WDAE-AM	504 REO ST	TAMPA, FL
ABQ 086990	F	33602	MR HALL	WFLA-AM & FM	801 E JACKSON ST	TAMPA, FL
ABQ 086995	F	33713	JOHN KELLER	C/O WFLA RADIO	217 23RD ST N	ST PETERSBURG, FL
ABQ 086996	F	33568	MARK BREWER	WFNN-AM/WVTY-FM	NEWS RADIO 1470	1473 SPRINGER RD PORT RICHEY, FL
ABQ 086997	F	33568	RICHARD CRANDALL	WVTY-FM/WFNN-AM	1473 SPRINGER RD	PORT RICHEY, FL
ABQ 087000	F	33708	C W CALDWELL	WGNB-AM & WKES-FM	5700 100TH WAY N	ST PETERSBURG, FL
ABQ 087010	F	33612	BILL BARBER	WHBO-AM	11011 N FLORIDA AVE	TAMPA, FL
ABQ 087020	F	33584	NEWS ASSIGNMENT EDITOR	WINQ-AM	P O BOX 1010	SEFFNER, FL
ABQ 087030	F	33602	NEWS ASSIGNMENT EDITOR	WJYW-FM	101 NORTH TAMPA ST	TAMPA, FL
ABQ 087070	F	33565	DON RICHARDS	WPLP-AM	P O BOX 570	PINELLAS PARK FL
ABQ 087080	F	33578	NEWS ASSIGNMENT EDITOR	WQSA-AM	P O BOX 7700	SARASOTA, FL
ABQ 087090	F	33580	NEWS ASSIGNMENT EDITOR	WSRZ-FM	4305 N TAMIAMI TRAIL	SARASOTA, FL
ABQ 087100	F	33518	LESLIE GREENE-SMITH	WQXM-FM 98 ROCK	P O BOX 4809	CLEARWATER, FL
ABQ 087110	F	33702	WARD COX	WQYK-FM 99	9450 KOGER BLVD SUITE 103	ST PETERSBURG, FL
ABQ 087120	F	33609	PAT BROOKS	WRBQ AM & FM Q105	5510 GRAY ST	TAMPA, FL
ABQ 087130	F	33712	VALARIE FLOWER	WRXB-AM	SUITE C-204	3000 34TH ST S ST PETERSBURG, FL
ABQ 087150	F	33540	JIM COOPER	WSST-AM	P O BOX 800	LARGO, FL
ABQ 087160	F	33731	RON EBBON	WSUN-AM	P O BOX 761	ST PETERSBURG, FL
ABQ 087170	F	33516	CANDICE DEAN	WTAN-AM SUNSHINE 1340	200 PIERCE BLVD	CLEARWATER, FL
ABQ 087180	F	33702	GARY BENJAMIN	WTIS-AM	311 112TH AVE NE	ST PETERSBURG, FL
ABQ 087190	F	33601	TOM HEAKERSON	WTMP-AM	P O BOX 1101	TAMPA, FL
ABQ 087200	F	33620	CHRISTIAN BRAUN	WUSF-FM	UNIV OF SOUTH FLORIDA	4202 FOWLER AVE TAMPA, FL
ABQ 087210	F	33742	DAVID MCKAY	WWBA-AM & FM	P O BOX 22000	ST PETERSBURG, FL
ABQ 087220	F	33609	DREW VOGEL	WYNF-FM Y95	504 REO ST	TAMPA, FL
ABQ 087240	F	33601	GEORGE RIOBEDRE	WYOU-AM	P O BOX 1988	TAMPA, FL
ABQ 087250	F	33517	JANICE HALL	CLEARWATER SUN	P O BOX 2078	CLEARWATER, FL

o.K.

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ABQ 087290 F 33601 STEVE MOORE                TAMPA TIMES                  P O BOX 191                TAMPA, FL
ABQ 087300 F 33704 NEWS EDITOR                AMERICAN LEGION NEWSCAST     ST PETE POST NO. 14        1520 4TH ST N
                                                                                                      ST PETERSBURG, FL
ABQ 087310 F 33528 PEGGY PAGE                 DUNEDIN TIMES                P O BOX 99                 DUNEDIN, FL
ABQ 087320 F 33589 BEA RAYNARD                HERALD NEWSPAPERS            TARPON AND SAFETY HARBOR   P O BOX 1028
                                                                                                      TARPON SPRINGS, FL
ABQ 087330 F 33589 PAUL STEWART               PALM HARBOR, TARPON AND      HOLIDAY LEADERS            P O BOX 1265
                                                                                                      TARPON SPRINGS, FL
ABQ 087340 F 33552 NEWS EDITOR                N PINELLAS SUNCOAST NEWS     P O BOX 663                NEW PORT RICHEY, FL
ABQ 087345 F 33541 SUNCOAST BEACON            P O BOX 836                  LARGO, FL
ABQ 087346 F 33515 JANIS COKER                SUNCOAST NEWS                3158 US 19 N               CLEARWATER, FL
ABQ 087355 F 33540 SUN COMMUNITY NEWS         2190 BELCHER RD              LARGO, FL
ABQ 087360 F 33565 NEWS EDITOR                PINELLAS PARK PRESS          P O BOX 1475               PINELLAS PARK, FL
ABQ 087370 F 33542 NEWS EDITOR                SEMINOLE AND PINELLAS PARK   BEACON NEWSPAPERS          9237 SEMINOLE BLVD
                                                                                                      SEMINOLE, FL
ABQ 087375 F 33540 LARGO LEADER AND           BELLEAIR BEE                 2979 WEST BAY DRIVE        BELLEAIR BLUFFS, FL
ABQ 087380 F 33540 DR LIPSY                   LARGO SENTINEL               P O BOX 303                LARGO, FL
ABQ 087400 F 33515 MRS GARRIS                 BEACH VIEWS                  P O BOX 3025               CLEARWATER BEACH, FL
ABQ 087410 F 33540 MYRA CHANDLER              BEACH BEE                    2979 WEST BAY DRIVE        BELLEAIR BLUFFS, FL
ABQ 087420 F 33736 NEWS EDITOR                ST PETE BEACH REGISTER       P O BOX 66057              ST PETERSBURG BEACH, FL
ABQ 087440 F 33609 FLOYD EGNER                TAMPA BAY BUSINESS WEEKLY    402 REO ST STE 218         TAMPA, FL
C ABQ 087460 F 33607 EDITOR                   FLA GULF COAST LIVING        1211 N WESTSHORE #809      TAMPA, FL
ABQ 087470 F 33731 RICHARD EDMONDS            EDITOR                       FLORIDA TREND              P O BOX 611
                                                                                                      ST PETERSBURG, FL
ABQ 087480 F 33733 VICTOR MORGAN              PINELLAS REVIEW              P O BOX 14446              ST PETERSBURG, FL
ABQ 087490 F 33733 ROBIN SEABORN              ST PETERSBURG AREA LEAGUE    OF WOMEN VOTERS            P O BOX 11775
                                                                                                      ST PETERSBURG, FL
ABQ 087496 F 33701 JOHN PILGER                BAY AREA TRAFFIC WATCH       333 1ST ST S STE 1504      ST PETERSBURG, FL
ABQ 087500 F 33516 MRS LOIS CORMIER           625 MCLENNAN ST
ABQ 087500         CLEARWATER,FL
ABQ 087510 F 33515 POST, BUCKLEY, SCHUH, AND  JERNIGAN, INC                2451 ENTERPRISE RD         CLEARWATER, FL
ABQ 087515 F 10080 ALAN SPEN                  MERRILL LYNCH PIERCE         FENNER AND SMITH INC       1 LIBERTY PLAZA
                                                                                                      165 BROADWAY NY, NY
ABQ 087520 F 33705 NEWS EDITOR                THE WEEKLY CHALLENGER        2500 9TH ST S              ST PETERSBURG, FL
ABQ 087525 F 33516 DAVID E OLSON              1529 US 19 S                 CLEARWATER, FL
ABQ 087530 F 33517 PUBLIC AFFAIRS COMMITTEE   JUNIOR LEAGUE OF             CLEARWATER INC             P O BOX 1061
                                                                                                      CLEARWATER, FL
ABQ 087535 F 33515 BONNIE HARDING             31 ISLAND WAY APT 1009       CLEARWATER, FL
ABQ 087540 F 33707 NEWS EDITOR                GULFPORT GABBER              1419 49TH ST S             GULFPORT, FL
ABQ 087255 F 33517 CLEARWATER TIMES           P O BOX 1698                 CLEARWATER, FL
ABQ 087260 F 33731 JACK REED                  ST PETERSBURG TIMES          P O BOX 1121               ST PETERSBURG, FL
ABQ 087270 F 33731 CITY DESK                  EVENING INDEPENDENT          P O BOX 1121               ST PETERSBURG, FL
ABQ 087275 F 33516 MARK ALBRIGHT              EVENING INDEPENDENT          710 COURT STREET           CLEARWATER, FL
ABQ 087280 F 33515 STEVE MOORE                TAMPA TRIBUNE                50 S BELCHER RD            SUITE 111 BUILDING D
                                                                                                      CLEARWATER, FL
```

Draft Report Coordination

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 4970
JACKSONVILLE, FLORIDA 32232

May 11, 1984

REPLY TO
ATTENTION OF
Planning Division
Coastal Branch

TO: ADDRESSEES ON ATTACHED LIST

The enclosed draft report and Environmental Impact Statement (EIS) provide study findings and recommendations for review of the existing beach erosion control project at Pinellas County, Florida. The study was performed to comply with the U.S. Congress, Committee on Public Works, Resolution dated September 23, 1976 and the United States Senate, Committee on Public Works, Resolution dated March 4, 1976. The study results are still tentative at this time.

The final draft report and draft EIS are provided for your review under policies and procedures established for coordinating civil work activities. Additional copies of the report and EIS can be obtained by any agency upon request. After your review, we would appreciate receiving any comments you may have within 55 days from the date of this notice. If additional time is required for your review, an interim reply is requested. If no comments are received within that period, we shall assume that you are in agreement with the report and EIS at this time. A public meeting will be held at the Pinellas County Courthouse, Board of County Commissioners assembly room (5th floor) 315 Court Street, Clearwater, Florida at 7:00 p.m., May 17, 1984.

Sincerely,

~~A. J.~~ Salem
Chief, Planning Division

Enclosures

LIST OF ADDRESSEES

State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
P.O. Box 1208
Gainesville, Florida 32601

Mr. Henry Walls
Regional Environmental Officer
Department of Housing & Urban
Development
75 Spring Street, SW, Room 576
Atlanta, G* 30303 (2 cys)

Division Engineer
Federal Highway Administration
P.O. Box 1079
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Seventh Coast Guard District (dpl)
51 SW 1st Avenue
Miami, Florida 33130

Mr. Sheppard N. Moore
Environmental Review Section
Environmental Protection Agency
Region IV
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Insurance & Mitigation Division
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1371 Peachtree Street NE
Atlanta, Georgia 30309

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Agriculture Stabilization and
Conservation Service
U.S. Department of Agriculture
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Regional Forester
Southern Region
U.S. Forest Service
Department of Agriculture
1720 Peachtree Road NW
Atlanta, Georgia 30309

National Marine Fisheries Service
Environmental Assessment Branch
3500 Delwood Beach Road
Panama City, Florida 32407

National Marine Fisheries Service
Office of the Regional Director
9450 Koger Boulevard
St. Petersburg, Florida 33702

Regional Director
U.S. Fish and Wildlife Service
75 Spring Street, SW
Atlanta, Georgia 30303

Mr. Justin Gillis
Miami Herald
5555 Hollywood Boulevard
Hollywood, Florida 33021

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Florida State Office
1350 Orange Ave., Suite 224
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Atlanta, Georgia 30309

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Environmental Health Services Div.
Center for Disease Control
Department of Health and Human Services
Atlanta, Georgia 30333 (2 cys)

Florida Audubon Society
1101 Audubon Way
Maitland, Florida 32751

Mr. John Rains, Jr.
Isaak Walton League of America, Inc.
5314 Bay State Road
Palmetto, Florida 33561

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U.S. Fish and Wildlife Service
P.O. Box 2676
Vero Beach, Florida 32960

State Planning & Development Clearinghouse
Office of Planning & Budgeting
Executive Office of the Governor
The Capitol
Tallahassee, Florida 32301 (16 cys)

U.S. ARMY CORPS OF ENGINEERS
GULF COAST AREA OFFICE
P.O. BOX 19247
TAMPA, FL 33686

Mr. Jim Baker
Van Wagenen and Searcy
1730 Shadowood Lane
Jacksonville, Florida 32207

Field Supervisor
Jacksonville Endangered Species Field Office
U.S. Fish and Wildlife Service
2747 Art Museum Drive
Jacksonville, Florida 32207

National Audubon Society
Southeast Regional Office
P.O. Box 1268
Charleston, South Carolina 29402

Dr. Jorge R. Rey
Florida Medical Entomology Laboratory
Institute of Food and Agricultural Sciences
University of Florida
P.O. Box 520
Vero Beach, Florida 32961

Environmental Information Center of the Florida Conservation Foundation, Inc.
1203 Orange Avenue
Winter Park, Florida 32789

Ms. Lynn Stein, Chairperson
Sierra Club
11 Lake Julia Drive South
Ponte Vedra, Florida 32082

RESOURCES FOR THE FUTURE
1755 MASSACHUSETTS AVE. N.W.
WASHINGTON, D.C. 20036

APALACHEE AUDUBON SOCIETY
P.O. BOX 1237
TALLAHASSEE, FL 32302

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Environmental Protection Agency
401 M Street SW
Washington, DC 20460 (5 cys)

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Department of Commerce - Room 5813 (PP/EC)
14th and Constitution Ave., NW
Washington, DC 20230 (4 cys)

Director
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Department of Energy, Room 4G064
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Washington, DC 20573

Mr. Charles Custard
Department of Health & Human Services
Room 537F Humphrey Building
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Washington, DC 20201 (2 cys)

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Federal Energy Management Administration
Room 713
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Department of the Interior, Room 424-1
18th and C Streets, NW
Washington, DC 20240 (12 cys)

Executive Director
Advisory Council on Historic
Preservation
1522 K Street NW
Washington, DC 20005

FLA. WILDLIFE FEDERATION
4080 N. HAVERHILL ROAD
WEST PALM BEACH, FL 33407

LEAGUE OF WOMEN VOTERS
CLEARWATER AREA
P.O. BOX 6725
CLEARWATER, FL 33518

HILLSBOROUGH COUNTY ENVIRONMENTAL
COALITION, INC.
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TAMPA, FL 33601

TAMPA BAY SANCTUARIES
NATIONAL AUDUBON SOCIETY
1020 82 STREET SOUTH
TAMPA, FL 33619

FLA. DEFENDERS OF THE ENVIRONMENT
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GAINESVILLE, FL 32601

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NATIONAL AUDUBON SOCIETY
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BRADENTON, FL 33505

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TALLAHASSEE, FL 32301

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